The Heating and Ventilating Magazine

A Monthly Journal of Engineering Progress

APRIL, 1925

Institutional Gymnasium Heating

Novel Methods Used in the Design for the Men's Gymnasium, Bloomingdale Hospital, White Plains, N. Y.

By Alfred J. Offner, M. E.

Offner & McKnight, Consulting Engineers

THE design of the heating system for the Men's Gymnasium building recently erected for the Bloomingdale Hospital, White Plains, N. Y., presented, in addition to the problem always existing in a building having neither cellar nor other space for piping, the problem of so designing the system that irresponsible patients could not injure themselves.

The building is heated by a vacuum steam heating system. Steam is supplied from the central heating plant, the condensation being returned by a vacuum pump. The steam enters the building at 40 lbs. pressure and is reduced to about 1 lb. before entering the heating system.

The hot water for the plumbing system is heated in the central plant and circulated to this and the other buildings.

While, in general, all of the other buildings of the hospital group are connected by underground tunnels used as service passages and for the heating, plumbing and electric distributing systems, the steam and return mains, together with the hot water flow and return mains, are run to the Men's Gymnasium Building in split-tile underground conduits.

The steam is supplied to the various radiators in the building by overhead mains, located in the attic spaces over the north and south wings and under the roof of the gymnasium room.

The return and drip mains, excepting short pieces run in trenches, are run exposed along the basement wall, through rooms where exposed pipes are not objectionable. This arrangement not only saved the cost of installing trenches but made these mains accessible for repairs.

Excepting in the gymnasium room, and in the basement rooms, the vertical drops are run concealed. In the gymnasium room, the vertical drops above the sill line are exposed, the drops below the sill line, which is the apparatus wall, are run concealed.

BRASS PIPES USED FOR CONCEALED RUNS

All pipes concealed in back of brick walls in the gymnasium room and all other rooms having brick-finished walls, (no plaster) are of brass pipe. The reason for the use of brass pipe in these cases, in preference to wrought-iron, is the longer lasting qualities. It would have been rather difficult to remove and replace sections of the brick finished walls in case of necessary repairs. All other heating pipes throughout the building are genuine wrought-iron of standard weight.

The overhead steam mains are dripped through the vertical drops, all branches being taken out of the bottom of mains. The end of each steam riser is dripped through thermostatic return valves into the drip mains. These drips are run under the radiators, the thermostatic return valve being located at the opposite end. The drips are in every case exposed and act as cooling legs for the return valve. This arrangement is shown in Fig. 5.

The gymnasium room has no suspended ceiling, the room extending up to the under side of the roof construction. The heat losses through this large roof area are taken care of by the exposed mains and wall radiation placed under the roof. These mains and wall radiators are painted the same color as the underside of the roof and are hardly noticeable. The wall radiators are provided with hand valves on the steam ends, to be used in case of necessary repairs to the return valves.

The gymnasium room proper is heated by exposed radiators hung on the walls approximately 7 ft. above the floor. In this location, they do not interfere with the apparatus and playing walls.

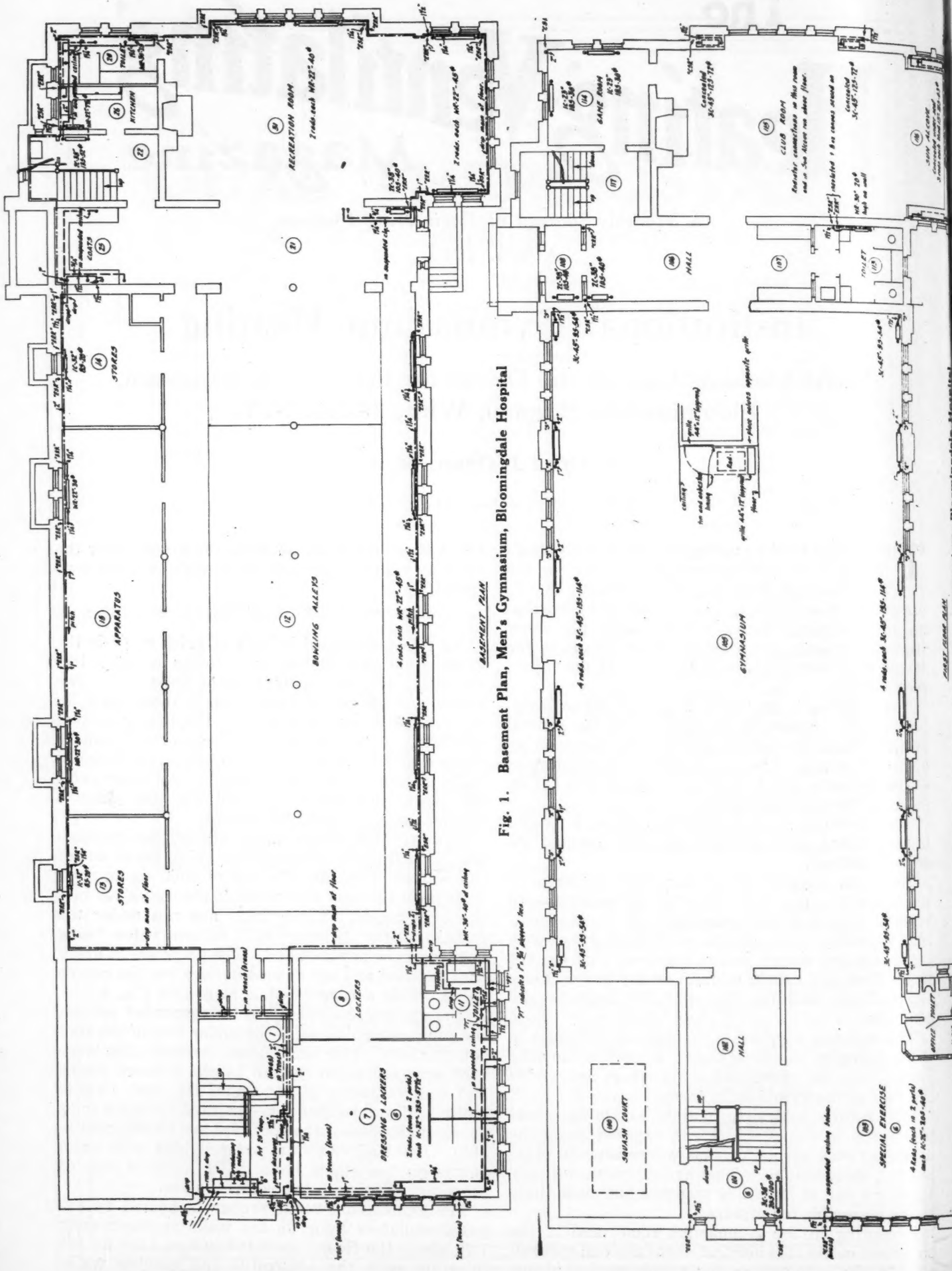

Fig. 1. Basement Plan, Men's Gymnasium, Bloomingdale Hospital

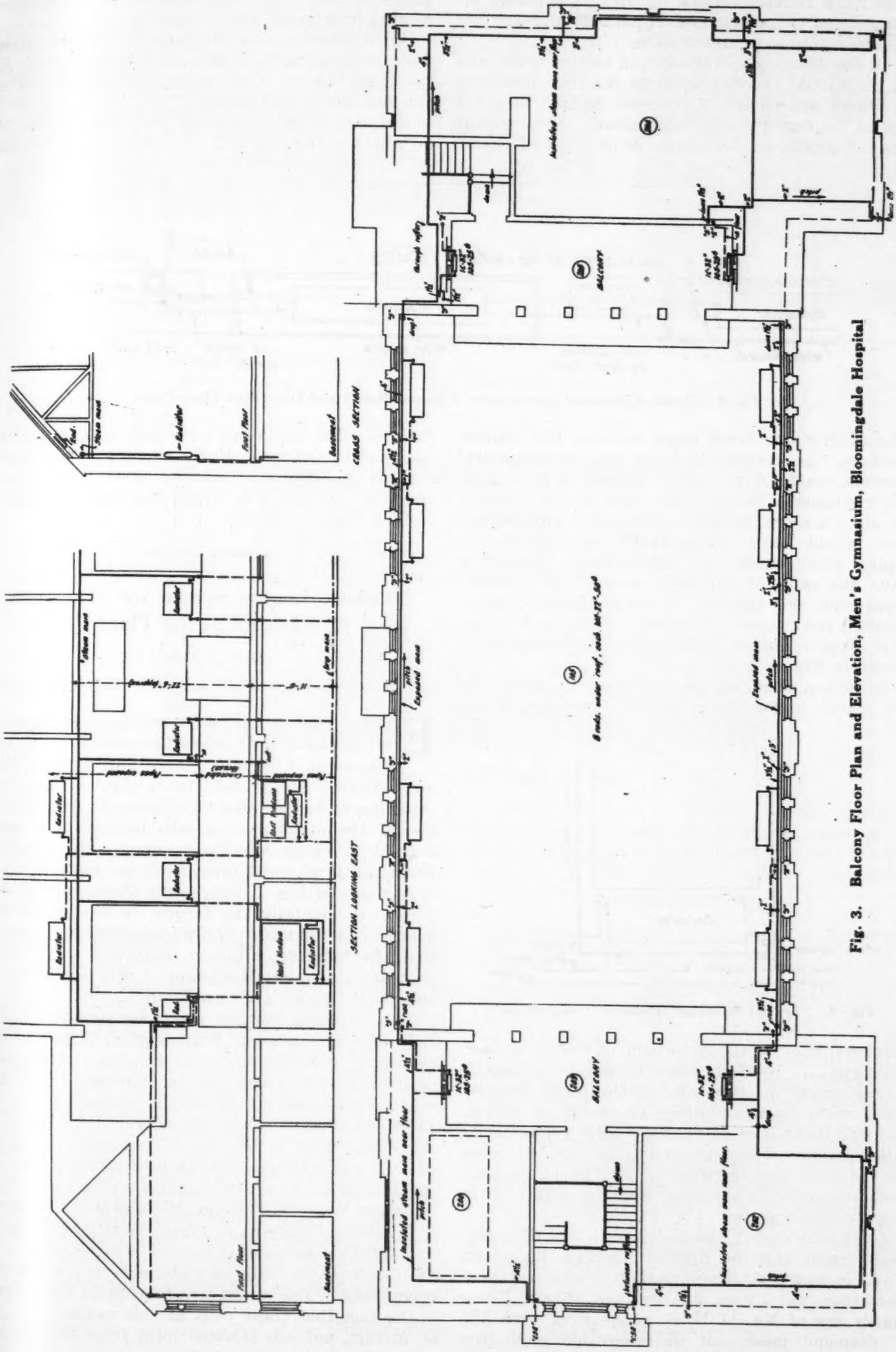

Fig. 3. Balcony Floor Plan and Elevation, Men's Gymnasium, Bloomingdale Hospital

The hung radiators work in with the general arrangement of gymnasium apparatus and are not objectionable as to appearance.

In the dressing-locker room in the basement and in the special exercise room on the first floor, the radiators are placed in recesses, so that they are out of the way and can be screened. These rooms are not plastered, but have brick-finished walls.

provided with extension stems and flush plates located in window sill.

All of the main control valves, the vacuum pump and the reducing valve are located in a room under the main stairs. The underground system enters the building at this point.

Grosvenor Atterbury, of New York, was the architect of the building. The heating system was

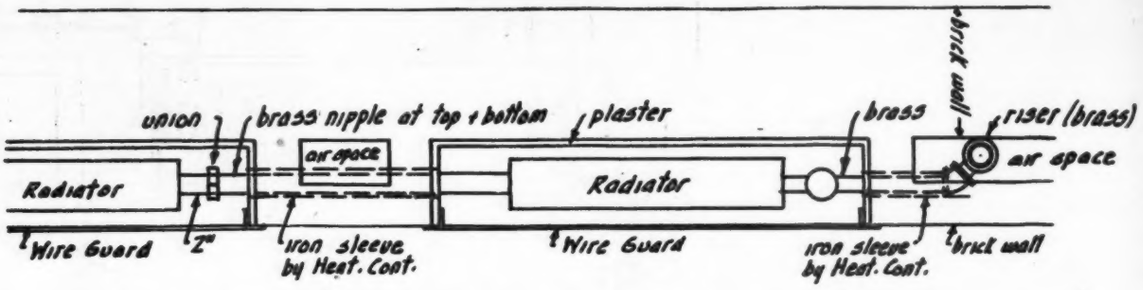

Fig. 4. Detail of Radiator Connections in Rooms Nos. 7 and 103 (First Floor Plan)

The mullions or brick piers between the window sections, for certain building and architectural reasons, could not be reduced in depth so as to leave one continuous recess under each entire window. To place a single radiator under each window section would have considerably complicated the piping arrangement. It was therefore decided to have one radiator for each two section window, separating the radiator by long nipples passing through iron sleeves imbedded in the brick piers. The nipples are of brass. The arrangement is shown in Fig. 4.

In the sun alcove on the first floor, the radiators, are placed under the seats and concealed in the

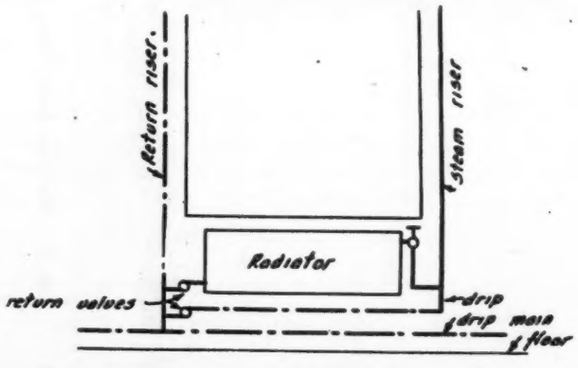

Fig. 5. Typical Basement Radiator Connections

usual manner. In the club room, on the same floor, the radiators are concealed in partly removable furred spaces on each side of the large window. These radiators are hung on the walls, in galvanized-iron ducts leading from the inlet grilles to the outlet grilles. The inlet grilles are located below the radiators near the floor, on the face of the wall. The outlet grilles are located near the ceiling in the reveal of the window.

As already stated, the radiators in the dressing-locker room and the Special Exercise Room are placed in recesses. These radiators, as a matter of protection, have wire guards over them. These guards are of No. 11 U. S. gauge steel wire, 1¾ in. diamond mesh, set in removable angle-iron frames. The radiators have key-operated valves designed by Offner & McKnight, consulting engineers, New York, and installed under their supervision by Hauxwell & Smith, heating contractors, of Port Chester, N. Y.

Jointless Heating System for a Modern Manufacturing Plant

By H. S. Arnold

Assistant Sales Manager, York Heating and Ventilating Corporation

EARLY Fall of last year saw the completion of a heating system in the Atwater-Kent Manufacturing Company's new and modern factory building in Philadelphia—a plant not only interesting to heating and ventilating engineers, but also to the manufacturer who believes that comfortable working conditions improve the quantity and quality of work turned out by his employes.

A glance at Fig. 1, which only shows part of the plant,—incidentally the largest in the world devoted to the manufacture of radio sets,—indicates that the building, although only one story high, provides an enormous amount of floor space and is both well lighted and ventilated.

This building, which was engineered by The Ballinger Company of Philadelphia, is heated by a battery of welded-coil unit heaters of the York type, several of which can be seen in the illustration. These machines consist essentially of a sheet-metal box open at the bottom and having a four-way outlet at the top. This box encloses a nest of welded pipe coils (Fig. 2). Each unit is equipped with a fan which draws in cool air from the floor level, up through the steam coils where it is heated, and finally forces it at low velocity through the openings at the top.

Of course, the heart of the device is the nest of steam coils. The distinctive feature of the heater is the fact that these coils are all welded. There is, in fact, not one screwed joint from the header

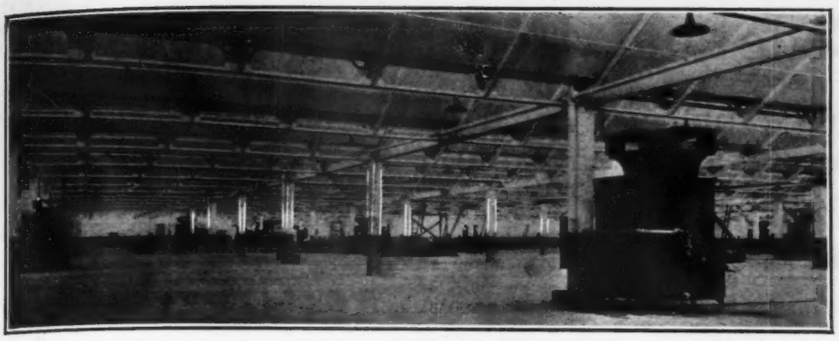

Fig. 1. Plant of the Atwater Kent Manufacturing Company, Showing Arrangement of Unit Heaters

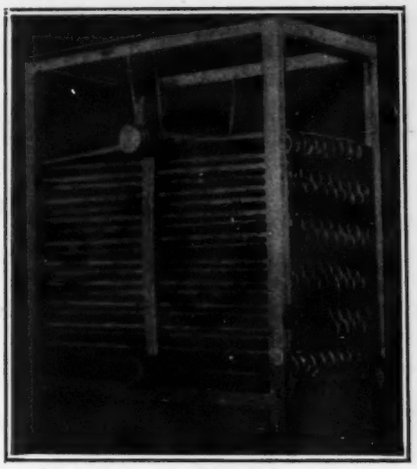

Fig. 2. Nest of Welded-Pipe Coils for Unit Heater

where the steam enters the coils to the header draining off the condensate. Pipes are made continuous from header to header with oxwelded joints. In addition, they are welded to the header. There are no connections subject to rust and the welded joints are expected to stand up even longer than the pipe itself. Because these heaters are thus insured against leaky joints, maintenance is correspondingly reduced.

Although the heaters are designed to work on either vacuum, low, or high-pressure steam, the coils are made strong enough to safely accommodate a pressure of 150 lbs. per square inch, each one being tested to 300 lbs. per square inch before it leaves the shop.

Fig. 5. Welded Pipe Line Hung in Position

This installation, which was handled by John P. Smith, Inc., Philadelphia, might be called an all-welded job, since even the pipe line supplying the heater coils with steam is welded. Some of the

(*Continued on Page* 68)

Fig. 3. Operator Cutting Pipe Back of the Thread Protector.

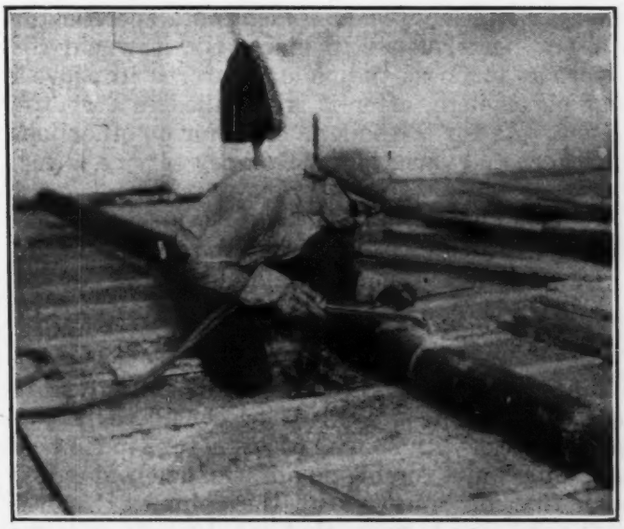

Fig. 4. Welding Pipe Joints on the Job

A State Code and Its Preparation

Notes on the Questions and Problems Which Arose in the Development of the Wisconsin Heating and Ventilating Code and Working Rules Supplement and How They Were Handled.

By R. A. Small, Advisory Engineer

Formerly Ventilation Engineer for the Industrial Commission of Wisconsin

(Concluded from March issue)

THE fewer the high per cent. split systems existent the more frequently and rigidly may they be inspected to see that the fans are operated during occupied periods. The more persistently the fans are made to run, the more readily will the jobs be changed over so that heating the rooms will also ventilate them. The combined heating and ventilating system with 50% recirculation will require about 30% less coal and heater capacity than the high per cent. split system with fan running during all occupied periods.

MANUFACTURERS' RATINGS AND ORDINARY PERFORMANCE

Having prescribed the results and service to be delivered, it is equally important that the working capacity of the equipment be such as to assure the desired performance with more or less indifferent attention and skill. This is also a very delicate matter to handle by code and most codes avoid it. Thus we have drifted into unfortunate chaos in the matter of boiler and furnace ratings. Other industries have standardized their products to some extent but, harsh as it may seem, a brief survey of catalog ratings and comparison of finished units shows that many heater manufacturers have turned feverishly to printers' ink instead of working tests, to describe their products. It is fundamentally wrong to accurately estimate the heat load and then *guesstimate* a safety factor of 60% to 100% in approaching the manufacturer's catalog.

The wary owner might follow the power plant manager and buy his equipment on a specification basis of performance in place, but it would cost almost as much as the boiler is worth to prove it isn't big enough, after it is installed in a heating system. As for the boiler's behavior on other jobs, the effect and variation of chimney service is such that almost any manufacturer can point out one or more jobs on which his heater is supplying more than the rated amount of heat delivery equipment.

CHIMNEY SIZES AND HEIGHTS SHOULD BE STANDARDIZED

Therefore, it is necessary to standardize the chimney size and height along with the heater rating. Size and height should be considered separately because, with normal efficiency, so much heat load will require combustion of so much coal and so much flue gas must go up the chimney, but the draft necessary to move that gas depends upon the design details of combustion and gas travel.

A table of heat loads and corresponding chimney diameters was prepared by the Advisory Committee and included in the Working Rules. Circular area divided by 0.80 is acceptable rectangular area, but no chimney flue should have the long side of cross-section more than twice the length of the short side.

Good architects will not seriously object to chimney size but when height is mentioned, they grow suspicious. Roofs may be steep or flat but esthetic beauty trembles at any utility projecting *above* the roof. Ascribing correct chimney heights for individual heaters according to their respective draft requirements, and standard size of chimney for all heaters, will materially assist in initial layout and subsequent architectural treatment of chimney extension; and it may lead to a series of ratings on individual heaters, according to the intensity of draft available.

BASIS USED FOR GAUGING WORKING CAPACITIES OF HEATERS

In casting about for a suitable gauge for working capacities of heaters, it became quickly apparent that for any given type of design the capacity could be estimated on the basis of physical characteristics, but a single formula for the whole field seemed well-nigh impossible, and equitable individual formulae for respective manufacturers would invite claims of partiality. Something had to be done at once, so a characteristic formula was devised for furnaces and the Chicago Master Steam Fitters' Association classification was used for boilers, temporarily, with the hope that a more searching standard would be set up until final ratings could be established by practical tests.

The leading heater manufacturers filed confidential physical characteristic data without objection and received official ratings based thereon. These ratings seem to check close to experience, generally, although somewhat conservative in a few cases of unusual design. Several large manufacturers of boilers submitted confidential data for use in devising a boiler standard, but others seemed to guard these data as trade secrets. Difficult as it was, however, a curve was plotted from available data, catalog ratings and professional experience therewith, and a public conference was called to discuss it as a criterion of allowable boiler capacities.

Years of advance were made that day in December, 1923. Representative manufacturers seemed

to sense the sincerity of our purpose and the necessity for accurate capacity data. They agreed to accept immediate recourse to actual test under rules to be prescribed by the commission; and that was the real rating desired.

The rating test rules laid down are those proposed to the American Society of Heating and Ventilating Engineers, with slight modifications to suit specific conditions generally prevalent in Wisconsin. Soft coal and wood are the most common solid fuels and the attendance is often inferior to that available in the manufacturer's laboratory where the tests are to be performed. Since the tests are apt to be pointed toward maximum capacity under given conditions, the test firing periods were fixed long enough for each size of heater so that under peak load conditions the local fireman can overcome his handicaps somewhat by firing oftener, without seriously neglecting his other duties. In this way he can carry the heat load in all weathers with a total waste of fuel probably less than the fixed charges on an increased investment for a larger heater.

The test firing period for soft coal is 4 hours for performance up to 2,000 sq. ft. E. D. R., decreasing uniformly at rate of 18 minutes per 1,000 sq. ft. to minimum period of 1 hour for 12,000 sq. ft. E. D. R. or over. The firing periods for wood are 50% less and for hard coal are 50% longer.

CODES MUST BE COMPILED FOR CONVENIENT USE

Convenience in use is another important attribute of a practical code. Convenience for one class of users may easily be awkward for others. The subjects are so interwoven in this field of engineering that it is difficult to treat each subject with individual completeness in logical sequence. In subject case the numerical system of other codes was extended and amplified to something like the system used in the statute creating the Industrial Commission.

The Wisconsin code proper is divided into five sections:

I Definitions
II Application of Code
III General Requirements
IV Classified Areas and Minimum Requirements Therefore.
V Classified Equipment and Particular Requirements Therefore.

Each section is titled and alloted a group of consecutive numbers. Each main subject is given a title and an order number in its respective group, and the individual items thereunder are also numbered and titled so that one may gather the gist of the item or order by noticing the title, as many people read newspapers. If further sub-divisions are necessary they are given alphabetic indices, without titles. In Section IV where similar items are repeated in the several orders, the items appear in like sequence, Items I for SCOPE, Item 2 for VENTILATION REQUIRED, Item 3 for MINIMUM AIR SUPPLY or MOVEMENT, etc.

This system works admirably in correspondence references and in review of plans, as well as in designing an installation. With a little practice one comes to know almost instinctively that any question about scope of code is answered in Order 5,810, anything pertaining to plans and data will be found in Order 5,820, etc. Repetitions are avoided except in Section IV, and each item is a single sentence or thought so that throughout the code a numerical reference is as clearly indicative of the particular point involved as a quotation would be.

The index system worked out for the code included a TABLE OF CONTENTS consisting of a subject synopsis of the entire code in true sequence, and a complete alphabetical index of titles and main thoughts, with cross references worked out as direct references. It is believed that anyone can use the code proficiently from the very first if he has a definite idea of what he wants to know.

CODE USELESS UNLESS PROPERLY ENFORCED

But after the code is all completed, indexed and published, the real work is only well begun. If the code is going to mean anything it must be enforced, and during the early precedent-making period the enforcement should be particularly rigid. Manifestly this matter of enforcement should not be a political football and if the office is non-political it is also sure to be overwhelmed with duties, because somebody has to do the *work*. With limited personnel, limited appropriation and a code that applies to members of all political creeds, the berth of the code official is anything but a bed of roses.

CODE OFFICIAL SHOULD BE GIVEN WHOLE-HEARTED SUPPORT

We must help him in every way possible. His decisions should be accepted as final. His mistakes should be borne with patience and good grace. We should establish in his mind and on the office records a clear demarcation between the "Cheap John" type of vendors who are always trying to get by with something, or to put something over on the department or to skin the unwary owner under cloak of blue-sky guarantees, and those of us who wish to comply with the code and keep a high standard of efficiency and service in our installations.

Completeness of plans and information therewith will help him. If your design and equipment is right you have nothing to hide. Support him with thought and pen and tongue. Purge the "grapevine" rumor channels, uphold the intent and service of the code at the lettings and do not use "compliance with code" as an alibi for high bids. Stem the tide of adverse criticisms in the trains and hotel lobbies. Get acquainted with the work and problems of code administration and tell the good in the results of the code in your community and field. Help the department to advertise its work, the "Cheap Johns" will spread the bad things in their own low way without your help. The importance of helpful propaganda can hardly be overestimated.

This is the sixth lesson of

The Heating and Ventilating Magazine's

New Home-Study Course in Gravity Steam and Water Heating

Instruction in this course is available only to subscribers of THE HEATING AND VENTILATING MAGAZINE. The first lesson appeared in November, but you can commence the course any time. As soon as your enrollment is received, Lesson 1 will be sent to you, together with the Work Problems pertaining to Lesson 1. Full directions will be included as to where to send your solutions of the Work Problems.

HOW TO ENROLL FOR THE COURSE:

The cost of the course complete, consisting of not less than 30 lessons, including a critical analysis of the work problems as solved by each student, is $80.00, payable in equal monthly installments of $10.00 each.

Below is an enrollment blank. Fill this out and mail it in at once so that there will be no delay in receiving the Work Problems and other instruction features of the course. With your enrollment send $10.00 in check or money order as the initial payment.

IMPORTANT—Students who satisfactorily complete the course will be awarded a Graduation Certificate which will correspond in value to the character of the lessons themselves.

Lesson No. 6.

EDITOR'S NOTE:—Lesson 6 is the first lesson of the section devoted to gravity water heating-systems. A definite system of numbering is adopted so that as the work progresses the location of every figure, table and assigned problem with respect to the entire course may be identified at a glance. For instance, Fig. H-1-4 is identified as presented with the hot water section by H; the first lesson of this section by 1 the fourth figure in Lesson 1 by 4. Tables and problems are similarly numbered.

IN Fig. H-1-1 is shown a simple open-type system with gravity circulation. Before considering how such a system operates, a clear understanding should be had of the simple laws which govern the movement of heated water through the parts of such a system, otherwise proper circulation of water will not be assured.

An open, gravity-type water heating system consists essentially of four parts: (1) the boiler for continually heating the water, (2) the piping for conducting the water from and to the boiler, (3) the radiators for holding temporarily a given quantity of water until it has given up a definite part of its heat, and (4) an expansion tank for providing storage space for the increased water volume caused by its expansion due to increase in temperature.

When there is no fire in the boiler, the system is said to be cold. The boiler, piping and radiators are filled with water at practically the same temperature. The expansion tank is partly filled. The water in the entire system is practically motionless.

(Do not fill in.) *Application for Enrollment for*

TECHNICAL INSTRUCTION

(BY MAIL)

IN GRAVITY STEAM AND WATER HEATING

HEATING AND VENTILATING MAGAZINE CO., 1123 Broadway, New York.

GENTLEMEN:

I enclose $10.00 for which please enroll me as a student in the home-study course in steam and water heating which you have arranged for your subscribers to take from the A-Em-Dee Engineering Co., Heating and Ventilating Engineers, subject to the following conditions:

(1) I hereby agree to pay a total of $80.00 for the complete course of instruction, assigned work, advice, and corrections of submitted work.

(2) If this application is accepted, I agree to pay the remaining balance, after deducting this first payment, in regular monthly installments amounting to not less than $10.00 monthly (commencing five days from the date of notification of the acceptance of this application) until the full amount has been paid.

(3) In consideration of the payments above specified, it is understood that I am to be supplied with text assignments as published monthly in THE HEATING AND VENTILATING MAGAZINE; work problems, additional tables and all matter that constitutes the course, by mail direct from the A-Em-Dee Engineering Company.

(4) If this application is not accepted, it is understood that the enclosed remittance is to be returned to me.

(5) If, in the judgment of the A-Em-Dee Engineering Company, my submitted work indicates lack of adaptability to the course, it is understood that upon notification, my status as a student shall terminate and I shall pay for only such text, prints, etc., as may have been sent me.

(6) I agree on my part to prosecute the work energetically, to devote regular time to study (in so far as may be possible) and to complete it without delay unless interference is caused by sickness or other unavoidable causes.

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Date..... Accepted.....

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The duty of the water is to convey heat from the boiler to the radiators from which it is imparted to the air of the rooms. To perform this duty the water must be set in motion and to perform it continuously the water must be kept in motion. There is practically no loss of water during operation within desirable working limits. The water is merely the carrier of the heat.

Every gravity-circulating system, regardless of how many pipes and radiators it may embody, may be reduced essentially to two columns of water, one designated as the ascending column and the other as the descending column. The ascending column, in a down-feed system (see Fig. H-1-1), consists of the boiler, supply piping and part of the water in the expansion tank, while the descending column consists of the radiator, return piping and part of the water in the expansion tank.

When a fire is started in the heater, the temperature of the water therein is raised. The water expands, its unit volume becomes lighter in weight and causes an ascending movement of the water in the supply piping. This difference in weight between a given volume of water in the ascending column and an equal volume in the descending column results in the establishment of a condition of unbalanced static pressure in the system. The rising of the lighter and warmer water in the ascending column and the falling of the cooler and heavier water in the descending column to be re-heated in the boiler and recirculated assures the continuance of operation so long as a fire is maintained in the heater.

By special arrangement with the A-Em-Dee Engineering Company, students in The Heating and Ventilating Magazine's Home-Study Course in Gravity Steam and Water Heating will be supplied with the lessons complete in convenient loose-leaf form. They will be printed on a fine grade of bond paper 6 in. by 9 in., triple punched, suitable for permanent filing in ring binders.

Each lesson will be accompanied by a cover sheet of different color and a set of the work problems. Each set of work problems will be issued on a different color paper so that they will be readily distinguishable from one another and each lesson will contain in detail a complete index by pages of the various subjects covered, together with an index of figures and tables.

All submitted work will be received on paper cut to the same size as the lessons so that when a student has completed the course he will possess a complete reference work on the subject, thoroughly indexed, which will prove invaluable to him in his future work.

Work Problem H-1-1

SYSTEMS OF WATER HEATING

The principle of heating by the circulation of heated water through a system of pipes and radiators may be applied in several ways and modifications of the different classified systems is not unusual. While this course presents the essential characteristics of the different systems of water heating it should not be presumed that every modification or combination of such systems is covered. With a clear conception of the principles as explained and applied throughout this work, the student should be able to plan and design a water heating system suited to given requirements or recommend, with assurance, advisable changes to existing systems that do not function properly.

In general, gravity water heating systems may be classed as follows:

One-pipe up-feed system.
Two-pipe up-feed system.
Two-pipe down-feed, single riser system.
Two-pipe down-feed, double riser system.
One-pipe circuit system.

Each of these systems and the application thereof will be covered in detail as we progress. A discussion of radiators and radiation is dealt with separately. It will be assumed in the discussion of the different water systems that the required radiation has been calculated and it will be stated wherever needed, either in the explanation of a certain system or for an assigned gravity water heating design problem.

PIPE SIZING

Previous to a consideration of the different types of systems of water heating, it is essential that the student be able to proportion pipe runs generally, according to the carrying capacity of the pipes of which a run consists. Two methods will be presented.

SIZING PIPES—METHOD 1

The carrying capacity of pipes is governed by diameter and, consequently, area; internal frictional resistance which varies directly as the area; and the condition of the interior surface of the pipe. The problem is usually presented as follows:

To find the size of pipe required to serve a number of smaller pipes of the same or different diameters.

Refer to Table H-1-1, which contains equivalent pipe data. In this table, the carrying capacity of each size pipe listed is, in turn, taken as unity and the equivalents for each size larger are expressed for diameters up to 8 in. Thus a pipe of 1-in. diameter is equivalent to 4.88 pipes of ½-in. diameter (by line A); or (by line H), a pipe of 4-in. diameter will supply 2.12 pipes of 3-in. diameter. Thus, this table affords a convenient means for determining, with reasonable practicality, the size of pipe required for serving a number of smaller pipes, or conversely, the number of pipes of a given size that may be supplied by a single pipe of a given diameter.

Work Problems H-1-2; H-1-3

Figure H-1-2 represents a run of piping from A to F from which five branches are taken off at

points B, C, D, E and F, respectively. The sizes of each branch are as follows:

Branch B, 2 in. diameter
C, 2½ in. diameter
D, 1½ in. diameter
E, 1¼ in. diameter
F, 1 in. diameter.

Disregarding the length of the run at this stage of the work and thereby assuming that the effect of length on operation is negligible (length of run may have a decided effect on operation and this will be discussed later in the course), we will proceed to determine the size of the different sections of the run, namely, EF, DE, CD, BC and AB.

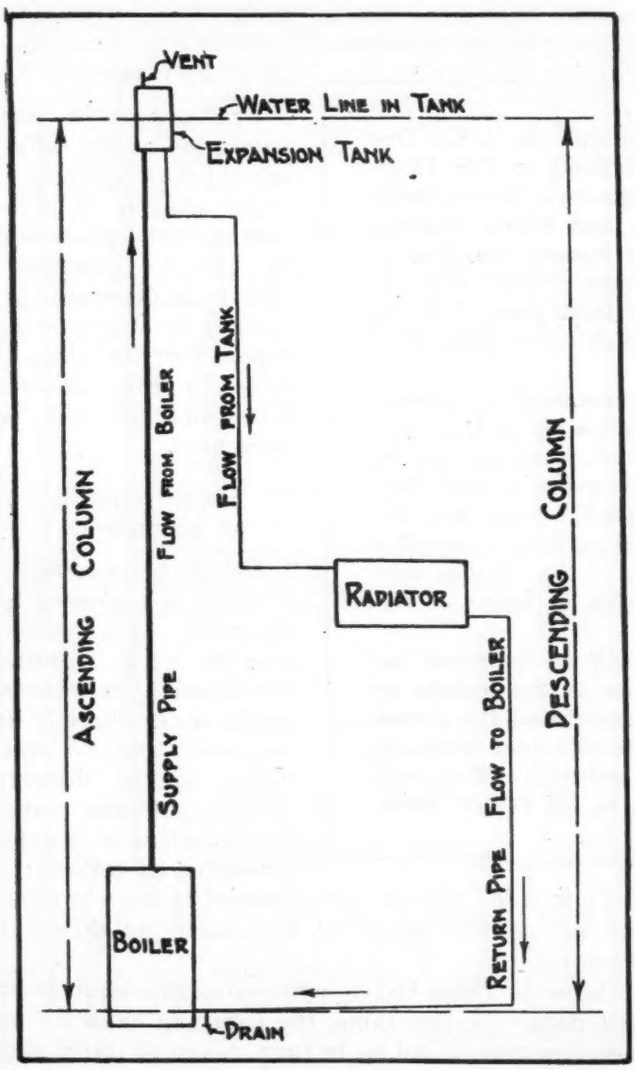

Fig. H-1-1. Typical Gravity Water Circulating System

The section EF supplies only the last branch, a 1-in. diameter pipe. By Table H-1-1, a pipe of 1-in. diameter is equivalent to 4.88 pipes of ½-in. diameter. So, in terms of pipes of ½-in. diameter. So, in terms of pipes of ½-in. diameter section EF is equal to 4.88.

The branch entering at E is of 1¼-in. diameter. By Table H-1-1, this is equivalent to 10.00 pipes of ½-in. diameter. Therefore section DE must be equivalent to 4.88 + 10.00 = 14.88 pipes of ½-in. diameter. Line A, Table H-1-1, indicates that a pipe of 1½-in. diameter is equivalent to 15.8 pipes

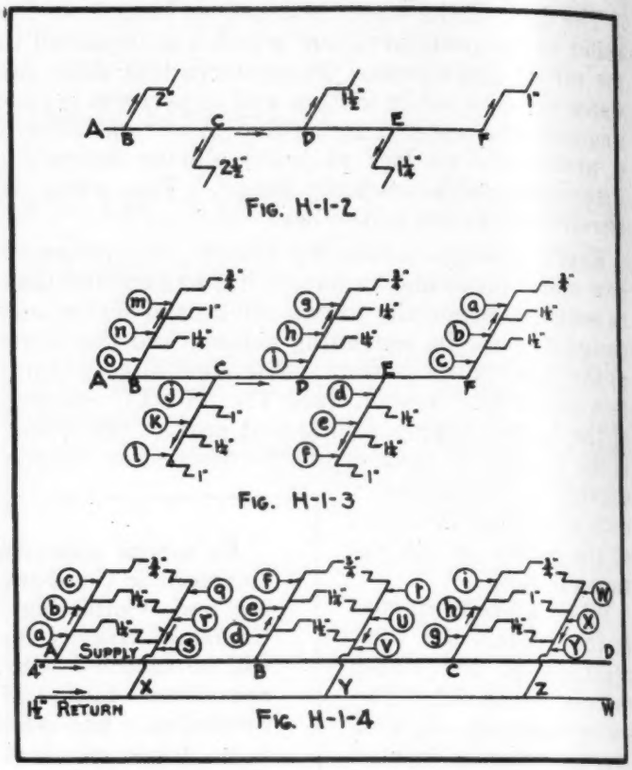

Fig. H-1-2. Single Pipe Run with Single Branches
Fig. H-1-3. Single Pipe Run with Multiple Branches
Fig. H-1-4. Supply and Return Pipe Run with Multiple Branches

of ½-in. diameter, therefore section DE should have a diameter of 1¼-in.

Section CD supplies section DE and in addition, the branch from D. Its equivalent in ½-in pipes must be equal to that for section DE + that for the branch from D or 14.88 + 15.8 = 30.68 pipes of ½-in. diameter; therefore, section CD should have a diameter of 2-in. (line A, Table H-1-1).

The size of section BC is determined similarly by adding the equivalent of the branch at C. Thus 30.68 + 52.9 = 83.58 pipes of ½-in. diameter; therefore, section BC should have a diameter of 3 in.

Similarly, 31.7 is added for the branch from B and section AB is equivalent to 83.58 + 31.7 =

TABLE H-1-1
EQUIVALENT PIPE DATA

REFERENCE	NOMINAL DIAMETER - INCHES											
	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8
A	1.00	2.27	4.88	10.0	15.8	31.7	52.9	96.9	140	205	377	620	1292
B		1.00	2.05	4.30	6.97	14.0	23.3	42.5	65	90	166	273	569
C			1.00	2.25	3.45	6.82	11.4	20.9	30	44	81	133	278
D				1.00	1.50	2.70	5.25	9.1	12	19	32	68	110
E					1.00	1.26	3.34	6.13	9	13	23	39	82
F						1.00	1.67	3.06	4.5	6.5	11.9	19.6	40
G							1.00	1.82	2.70	3.87	7.12	11.7	24
H								1.00	1.50	2.12	3.89	6.39	13.3
I									1.00	1.25	2.50	4.25	9.0
J										1.00	1.84	3.02	6.3
K											1.00	1.65	3.4
L												1.00	2.1
M													1.00

TABLE H-1-2
EQUIVALENT PIPE FACTORS

NOMINAL DIAMETER INS.	FACTOR
½	2
¾	5
1	10
1¼	20
1½	30
2	60
2½	110
3	175
3½	260
4	380
5	650
6	1050
7	1600
8	2250

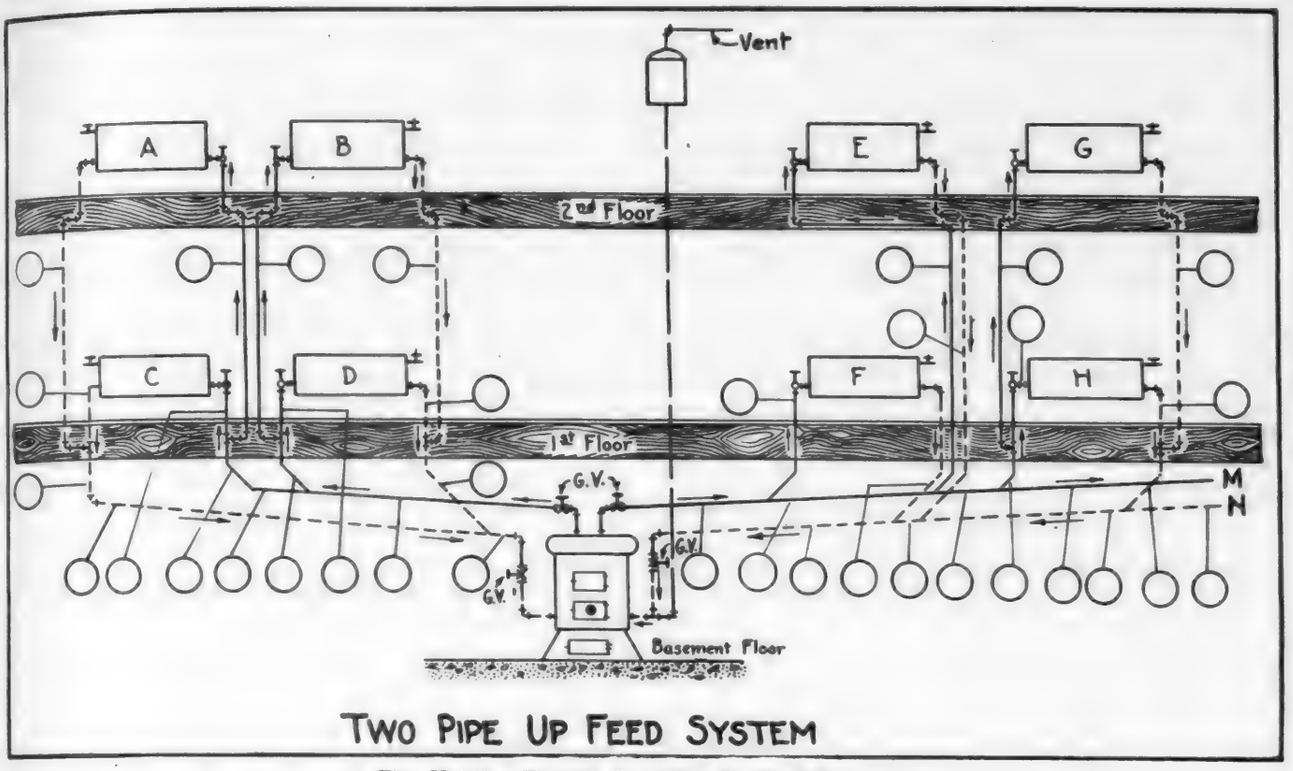

Fig. H-1-5. Typical Two-Pipe Up-Feed System

115.28 pipes of ½-in. diameter, indicating that section AB should have a diameter of 3½ in.

Summarized, the diameters of the sections are as follows:

Section AB	—	3½	in. diameter
BC	—	3	in. diameter
CD	—	2	in. diameter
DE	—	1¼	in. diameter
EF	—	1	in. diameter.

Work Problem H-1-4

SIZING PIPES—METHOD 2

Table H-1-2, which contains pipe factors, may be used in a manner similar to Table H-1-1 for the same purpose. By some, it is considered somewhat more convenient. In assigned problems, the student may use either table unless otherwise instructed.

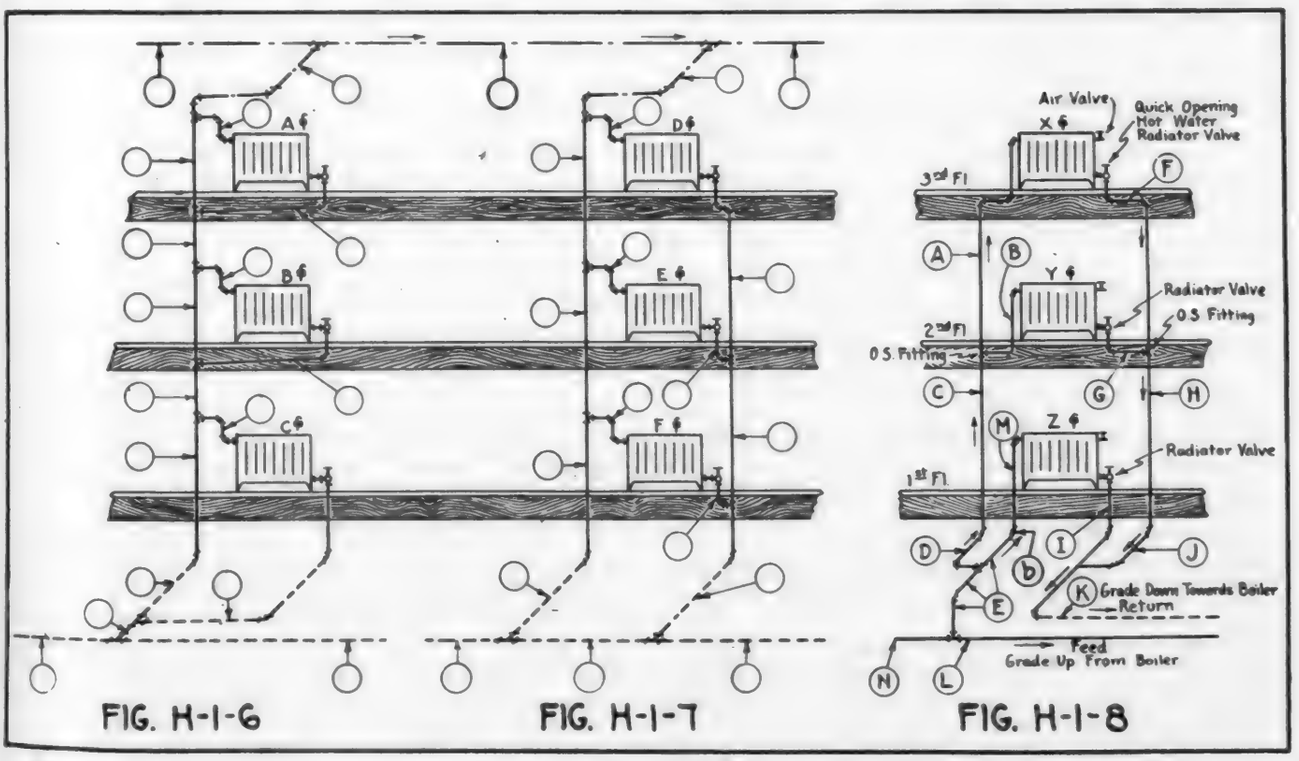

Fig. H-1-6. Typical Radiator Group, Down-Feed with Single Return.

Fig. H-1-7. Typical Radiator Group, Two-Pipe Down-Feed System.

Fig. H-1-8. Typical Radiator Group, Two-Pipe Up-Feed System.

Section CD must be capable of supplying one 1-in. branch, one 1¼-in. branch and one 1½ in. branch. Its factor is found as follows:

One 1-in. branch	= 1 x 10 (factor from table H-1-2)	= 10
One 1¼-in. branch	= 1 x 20 (factor from table H-1-2)	= 20
One 1½-in. branch	= 1 x 30 (factor from table H-1-2)	= 30
	Factor for section CD	= 60

Therefore CD should be 2 in. in diameter.

In a similar manner, the required diameter for section AB is found as follows:

One 1-in. branch	= 1 x 10 (factor from table H-1-2)	= 10
One 1¼-in. branch	= 1 x 20 (factor from table H-1-2)	= 20
One 1½-in. branch	= 1 x 30 (factor from table H-1-2)	= 30
One 2½-in. branch	= 1 x 110 (factor from table H-1-2)	= 110
One 2-in. branch	= 1 x 60 (factor from table H-1-2)	= 60
	Factor for section AB	= 230

Therefore AB should be 3½ in. in diameter.

tion of flow. Several arrangements of piping to and from the radiators are indicated. The supply main M and return main N are supposed to extend to supply other radiators.

Work Problem H-1-6

The size of each radiator valve and of the piping for the entire system is governed mainly, (1) by the area of heating surface of the radiator, invariably expressed in square feet, (2) the method by which water is conveyed to and from the radiator, (3) the height of the radiator above and its distance from the boiler, and (4) as to whether it is a direct or indirect radiator.

The type of system is very important and it is most essential that requirements and conditions be fully understood before proceeding with actual design work. For the time being, it will be assumed

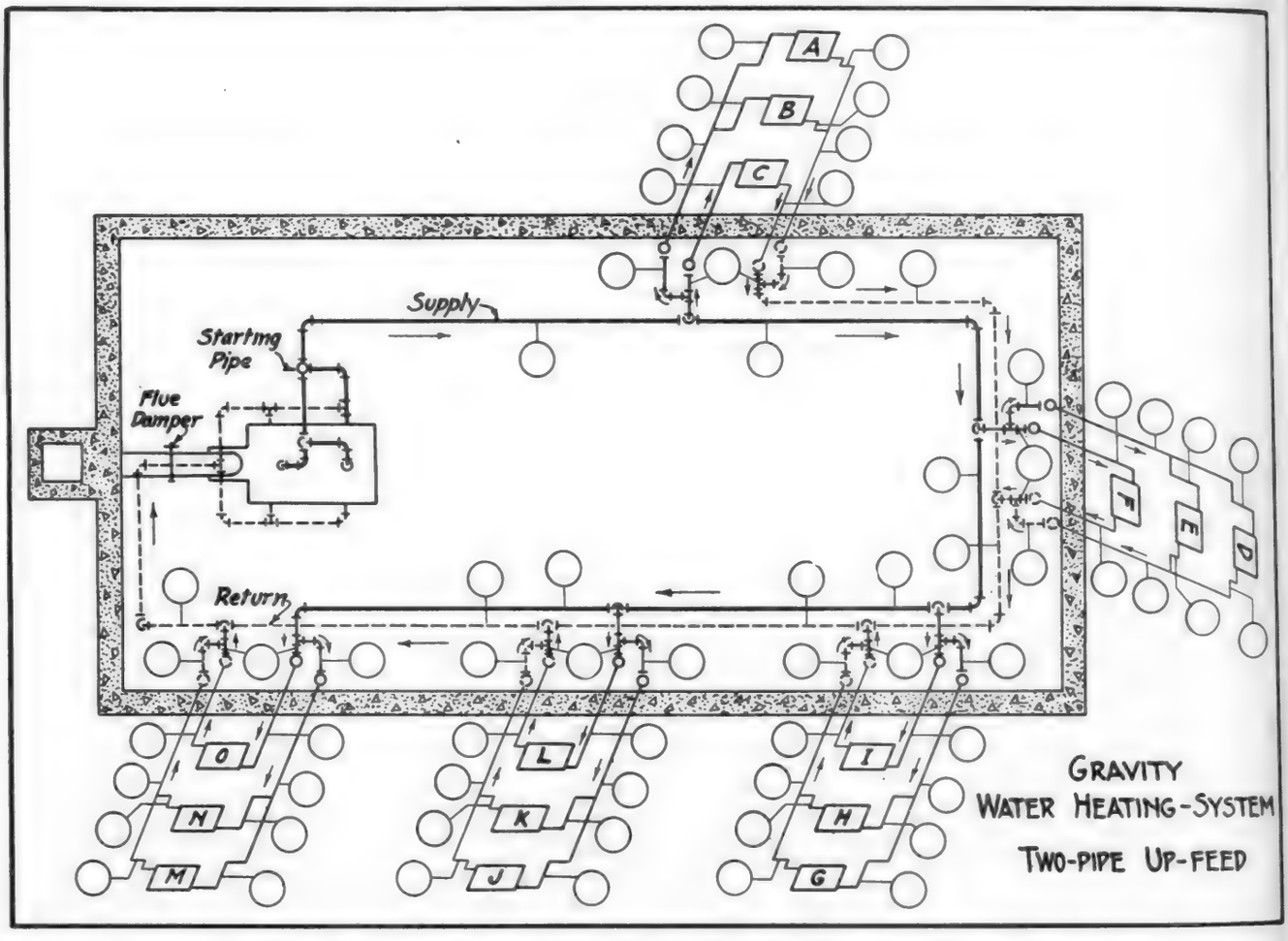

Fig. H-1-9. Basement Plan for a Two-Pipe Up-Feed Gravity Water Heating System

Work Problem H-1-5

GENERAL CONSIDERATIONS AFFECTING THE DESIGN OF WATER HEATING SYSTEMS

Before considering the different arrangements of piping for the various types of water heating systems in detail, there are certain essentials with which the student should be familiar.

Figure H-1-5 shows a typical layout for a two-pipe, up-feed open-tank water heating system having eight radiators. The arrows indicate the direc-

that references are made to an open-tank heating system. It may be mentioned in passing that in a closed-tank system the water circulates much faster than through an open-tank system and this requires the use of comparatively larger radiator valve areas, on open than on closed systems for radiators of the same size, similarly located.

Work Problem H-1-7

Furthermore, heated water has a tendency to flow quickly to the highest point of a heating system.

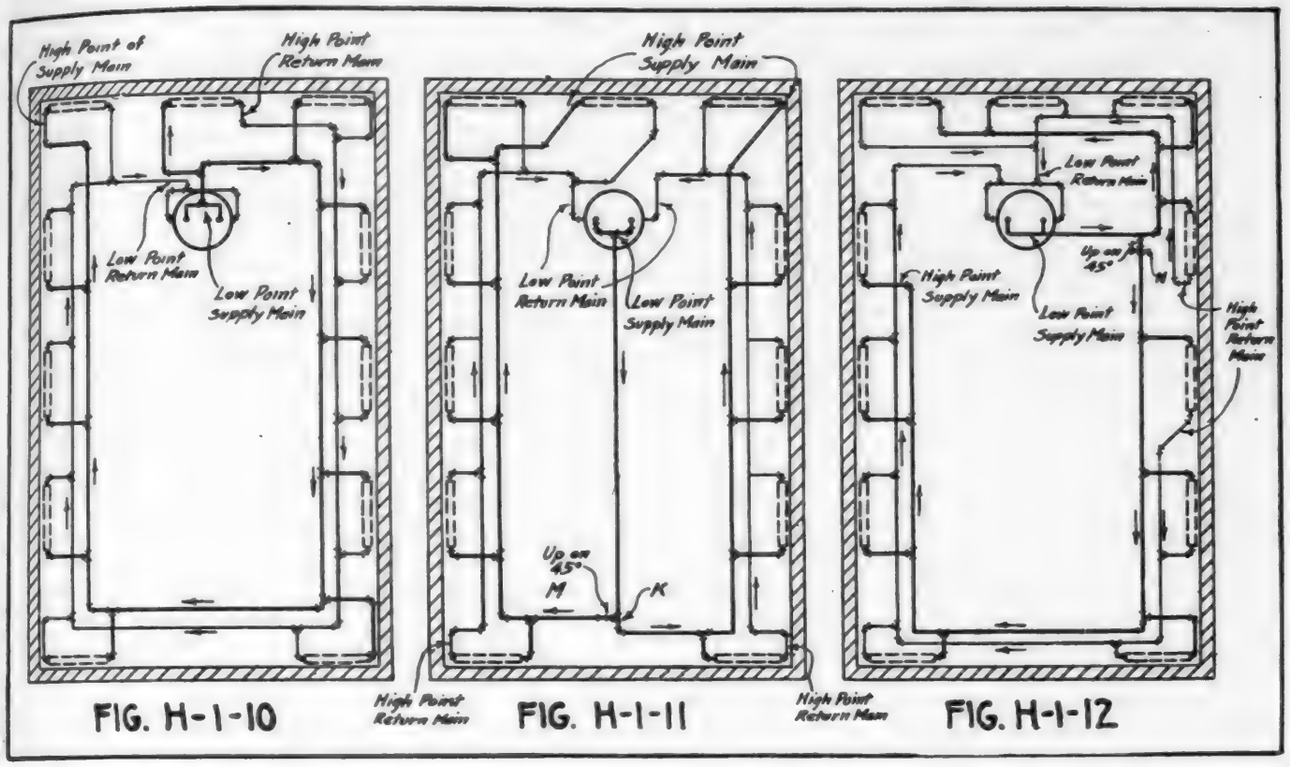

Fig. H-1-10. Simple Reversed Return, Two-Pipe Up-Feed Circuit System.

Fig. H-1-11. Equally Divided Supply and Reversed Return Two-Pipe Up-Feed System.

Fig. H-1-12. Unequally Divided Supply and Reversed Return Two-Pipe Up-Feed System

Therefore, a pipe or valve of given size or area will supply a greater amount of radiation located on the second than on the first floor and a greater amount to a third-floor radiator than to one on the second floor. All these facts should be considered in order to design an efficient gravity water heating system.

Much judgment on the part of the designer is required in planning and proportioning mains, risers and branches for gravity water heating systems, regardless of the type of system employed. It is impossible in any written work on this subject to cover all conditions of detail design and installation. A complete presentation of the fundamentals and a mastering of them by the student is an absolute necessity if he would be prepared to avoid many of the pitfalls so often encountered in a more or less costly manner.

Gravity water heating systems may easily be thrown out of balance. This condition exists when radiators near the boiler get very hot water and the returns therefrom are correspondingly warmer than others farther along in the system. It, therefore, should be impressed upon the mind of him who would perform work that begets work, that a perfectly functioning job, especially, if the installation is larger than the ordinary residential plant, requires expert and careful designing in order to avoid short-circuiting and sluggish circulation. To maintain correct balance, every unit in the system must be capable of performing its independent function properly and of contributing its part toward correct balance of the entire system.

It is not unusual, indeed, it is frequently the case in gravity water heating systems that the return water from the first radiator supplied is the first to reach the boiler for re-heating and re-circulating, while that from the last radiator is the last to return. This condition usually causes sluggish circulation and thus uneven heating of the radiators. It should be guarded against.

PIPING RADIATOR GROUPS

Figure H-1-8, shows a group of radiators for first, second and third floor piped for a two-pipe up-feed gravity water heating-system. Figure H-1-9 shows a basement plan for such a system with the radiator runs extending from the risers so as to permit clear presentation of the respective pipe sizes. Radiators on the different floors are designated by letters.

Figure H-1-9, shows the installation piped as a "reversed" return run, that is, the first radiator group supplied (A, B, C), is the one most distant from the boiler on the return side. This is preferable to a "direct" return (as mentioned above) in which the water first circulates through the radiators nearest the boiler and then through each succeeding group in turn, with the result that the ends of the main are slow in warming up; the last radiator may be "cold" and unsatisfactory operation result.

The piping runs shown in Figure H-1-9 make one complete circuit with mains pitching in opposite directions and consequently with water flowing in opposite directions. This is a very satisfactory method of piping a gravity water heating system, especially for buildings that are approximately square. The flow and return pipes are run

close to the basement ceiling; the flow grades up from the boiler and the return grades down towards it. The slope should be not less than ¾ in. in every 10 ft. for both supply and return lines.

Work Problems H-1-8; H-1-9

TYPICAL REVERSED RETURN LAYOUTS

Figures H-1-10, H-1-11 and H-1-12 show three typical "reversed" return layouts. The radiators on the first floor are shown dotted. The supply is shown as a fairly broad solid line, the return as a solid line somewhat narrower. The supply main is pitched upward from the heater with the high point at the last radiator take-off and low point where it leaves the heater.

Figure H-1-10 shows the simplest layout consisting of a circuit system with continuous return line. Fig. H-1-11 shows an equally-divided or two-circuit system with two reversed returns. The two sides of the main that extend from the point K should be balanced as to radiation supplied if 90° ells are used at the branch turns. When radiation supplied by two branches is not exactly but nearly equal for the two sides, the branch mains may be made the same size and the side carrying the slightly greater amount of radiation may be favored by setting the T-branch so as to rise with a 45° ell as indicated in Fig. H-1-11 where the right-hand branch supplies five radiators while the left-hand branch supplies six radiators, all assumed to have equal radiating surface.

TABLE H-1-3 GRAVITY WATER HEATING - SYSTEM

TWO-PIPE UP-FEED OPEN TYPE SYSTEM

PIPE SIZES IN TERMS OF RADIATION

MAINS		
PIPE SIZE INS.	DIRECT RADIATION SQ. FT.	INDIRECT RADIATION SQ. FT.
1¼	135	100
1½	220	135
2	350	225
2½	460	320
3	675	500
3½	850	650
4	1100	850
4½	1350	1050
5	1700	1350
6	3600	2900
7	4800	3900
8	6200	5000
9	7700	6300
10	9800	7900
12	14000	11400

NOTE:- LENGTH OF MAIN MUST BE MEASURED BACK TO BOILER. FOR MAINS OVER 100' MUST REDUCE CAPACITY IN RATIO OF $\frac{100+L}{200}$

TABLES BY J.J. HOGAN

AUTHOR OF TABLES RECOMMENDS THEIR USE FOR ONE AND TWO PIPE WORK.

BRANCHES AND RISERS				
PIPE SIZE INS.	FLOOR			
	FIRST	SECOND	THIRD	FOURTH
	DIRECT RADIATION - SQ. FT.			
¾	30	45	55	70
1	60	75	85	95
1¼	110	120	135	150
1½	180	195	210	230
2	290	320	350	370
2½	400	490	525	550
3	620	650	690	730
3½	820	870	920	970
4	1050	1120	1185	1250
4½	1325	1400	1485	1560

NOTE:- FIRST FLOOR SUPPLY RISER CONNECTIONS SHOULD BE TAKEN FROM TOP OF MAIN AND RISERS. ABOVE FIRST AT 45°. ALL RETURNS INTO SIDE OF MAIN, (OR BOTTOM).

HARDING & WILLARD

TABLE H-1-4 GRAVITY WATER HEATING - SYSTEM

BALANCED OPEN TYPE SYSTEM

PIPE CAPACITIES IN SQUARE FEET OF RADIATION

PIPE SIZE INS.	RADIATORS			RISERS		MAINS	
	1ST FLOOR	2ND FLOOR	3RD FLOOR	2ND FLOOR	3RD FLOOR	LONG	SHORT
¾	40	55	70	60	90		
1	60	85	120	110	140		
1¼	100	130	160	170	200		
1½	150	190	250	225	300		200
2	250	300	400	450	600	200	450
2½				600	900	450	700
3						700	950
3½						950	1300
4						1300	2000
5						2000	3000
6						3000	4000
7						4000	6000
8						6000	8500

Work Problems H-1-10 and H-1-11

Fig. H-1-12 shows a circuit somewhat similar to that of Fig. H-1-11 but with the supply main divided nearer the boiler. Thus, there is one short circuit that supplies the radiators nearest the boiler and a longer circuit that supplies the balance of the radiators. An arrangement like this may often be used with excellent results when radiators nearest the boiler are on the cold side of the building. In designing such a system, special care must be observed to obtain balance. The longer main may require that one size larger pipe be used than the calculations indicate and it may be advisable to favor circulation to it by taking off the branch with a 45° ell turned up as noted at N, Fig. H-1-12. Another solution might be to reduce the size of the smaller main by a pipe size and turn upward the ell that holds it, so as to take this branch practically off the top of the main. An uneven divided supply like this has its limitations so if the job is large, it is decidedly better to use a center main as shown in Fig. H-1-11.

Work Problem H-1-12

This unequal divided supply also contains the "reversed" return feature for in each case the first radiator supplied is the last to have its return reach the boiler while the water to the last radiator supplied is the first to return. The length of water travel from the boiler to the radiator and back to the boiler should be as near equal for each of the different groups of radiators as it is possible practically to design and install the piping. In this manner, resistance to be overcome is practically the same for each group of radiators, irrespective of the distance of each group from the boiler. It should be noted that the return water starts at the first radiator served and flows in the *same* direction as the supply water, the main being increased in size as additional returns enter while the supply main is decreased in a similar manner after it has fed additional radiators.

Although omitted from Figures H-1-10, H-1-11 and H-1-12, for the sake of clearness, each supply and return connection at the boiler preferably should be provided with a valve and an expansion tank should be included. The line from the boiler to the expansion tank should contain no valve or any obstruction that might or could interfere with circulation thereto.

Work Problem H-1-13

DETERMINING RADIATOR VALVE AND PIPE SIZES FOR A GROUP OF RADIATORS

While tables are available by which pipe and radiator valve sizes, branch and main sizes may be specified and tables for this purpose are given in this course, a note of warning should be sounded with respect to the arbitrary use of them lest the student get the impression that they may be used as one uses a yardstick. Judgment cannot be entirely eliminated. A hard and fast rule for tables of capacities cannot be presented. Exceptions and modifications are frequently necessary. Such tables, however, are very useful in simplifying design work and when viewed as a means to an end have a very definite and proper place in heating design work.

TABLE H-1-5 GRAVITY WATER SYSTEM.
PIPE SIZES
OPEN-TANK UP-FEED SYSTEM

RADIATOR LOCATION	DIRECT RADIATION SQ. FT.	SIZE OF TAPPING
FIRST FLOOR	25 or Less	¾ Inch
	26 to 50	1 "
	51 to 85	1¼ "
	86 to 125	1½ "
SECOND FLOOR	40 or Less	¾ "
	41 to 60	1 "
	61 to 100	1¼ "
	101 to 175	1½ "
THIRD FLOOR (AND ABOVE)	50 or Less	¾ "
	51 to 80	1 "
	81 to 125	1¼ "
	126 and Above	1½ "

In cases of extreme exposure or under conditions where circulation to and from it may be difficult, one size larger valve than ordinarily called for should be used. It is good practice to increase the valve size for a first floor radiator when it is the last connected radiator and is at the end of a main.

TABLE H-1-6.

FLOOR	DIRECT RAD.	PIPE SIZE
1ST	50	¾"
	100	1"
	200	1¼"
2ND	100	¾"
	200	1"
3RD	ALL	¾"

Four tables are included that have been collected from different sources. Where the authority is omitted, it is not known, the data being taken from the data files of the author.

Sizes of valves and piping obtained from one table for radiators of given area and location will likely vary slightly with those taken from another but practice and application will enable the student to select or possibly adopt one table in preference to another.

Throughout this work, for the sake of uniformity, the table which is to be used in each assigned problem will be stated and where necessary the modifications will be given.

Referring to Fig. H-1-8 and using Table H-1-3, the pipes are proportioned as follows:

Size of Radiators
Third floor—radiator X—90 sq. ft.
Second floor—radiator Y—65 sq. ft.
First floor—radiator Z—50 sq. ft.

First: Use table (H-1-3 in this case) and read sizes of radiator valves.

For X, use 1¼ in.
Y, use 1 in.
Z, use 1 in.

Second: Use Table (H-1-3 in this case) and determine sizes of supply branches to each radiator.

For X, make pipe A 1¼ in.
Y, make pipe B 1 in.
Z, make pipe M 1 in.

Third: Determine sizes of return branches to each radiator. For the two-pipe up-feed system these are made the same as the supply, so make pipes,

F = 1¼ in.; G = 1 in.; I = 1 in.

Fourth: Determine size of risers that supply more than one radiator. Pipe C, for example, is a riser supplying radiators X and Y. Use Table H-1-2.

Factor for pipe A (1¼ in.) = 20
Factor for pipe B (1 in.) = 10
Factor for pipe C = 30; Use 1½-in. pipe.

Fifth: Determine size of branch from main. The pipe supplying the first-floor radiator is run full size over to the heel (point b, Fig. H-1-8) in order to favor the lowest radiator. Assume all radiation located on first floor, thus 90 + 65 + 50 = 205 sq. ft. will require a 2-in. pipe and pipe E = 2 in. from main to heel and pipe D corresponding to pipe C will be 1½-in.

Sixth: Note sizes of returns as

H = 1½ in.; J = 1½ in.; K = 2 in.

Seventh: Determine size of supply main after taking off for a group of radiators. Assume N (for this example) to be a 3½-in. pipe. By Table H-1-3, a main of this size will will supply 850 sq. ft. of direct radiation. Subtracting the total of group X, Y and Z (205 sq. ft.) there remains 545 sq. ft. for which pipe L must carry water and this calls for a 3-in. pipe.

Work Problems H-1-14; H-1-15; H-1-16

Some designers believe in using very much smaller sizes for risers and radiator valves than are indicated by Tables H-1-3, H-1-4 or H-1-5. Where a liberal size main is used and a good pitch provided, the author has secured good results in two and three story houses by using risers and radiator valves that correspond to those given in table

(*Continued on Page* 68)

Tests on a Heat Exchanger for Domestic Water Supply

Details of Further Experiments in Generating Hot Water From the Same Source Which Supplies Heat for the House

By Joseph Harrington

Consulting Combustion Engineer

THE object of the installation here shown was to develop means for conveniently heating the domestic water supply from the same burner which supplies heat for warming the house. The completely automatic character of the NoKol burner seemed to promise well and I therefore secured from the Breese Engineering Company one of its heat exchangers which I installed in connection with the Breese boiler in my house. The accompanying illustration (Fig. 1) will show this clearly. A brief description of the equipment follows:

DESCRIPTION OF EQUIPMENT

At a point close to the ceiling of the basement, directly above the boiler, I suspended a 62-gal. galvanized-iron tank. Between this and the boiler I installed a Breese heat exchanger which is so connected that the flow and return of the house-heating water passes through the heads of the heat exchanger. In the upper head is placed a Minneapolis aquastat. This aquastat is electrically connected with the controller of the NoKol burner so that when a certain temperature is reached at this point the aquastat stops the burner, and, conversely, when the temperature drops one or two degrees, the aquastat reverses itself and starts the burner. All of the water from the boiler flowing to the house passes by this aquastat and if it were desired to control the house temperature from water temperature alone, it would be simple enough to set the aquastat at any given point which would automatically provide a water temperature without reference to anything else.

In the flow pipe above this aquastat there is a Crane butterfly valve which is operated from a Minneapolis controller responding to the position of a thermostat upstairs in the house. This thermostat controls the regulator in the usual manner causing it to rotate the crank shaft half a turn and then back again in accordance with its contact on the hot or cold side of the thermostat.

The heat exchanger is placed midway between the boiler and the hot water tank in elevation and is connected to the hot water tank by two pipes, one from the extreme upper end, which delivers the hot water to the tank, and one at the extreme lower end, which carries cold water from the tank to the exchanger. The heat exchanger itself is built of a standard 6-in. steel pipe about 6 ft. long into which is welded a diaphragm at either end. These diaphragms are perforated in a manner to admit the ends of a number of 1-in. standard steel pipes like the tubes in a boiler, extending from one end to the other and being welded into the diaphragms.

This construction then provides two compartments, the water from the boiler flowing through the 1-in. pipes and the water from the tank surrounding the pipes on the outside, just the same as the water in a return-tubular boiler.

HOW THE SYSTEM OPERATES

The operation of the system is like this: When the butterfly valve is opened under the influence of the temperature in the rooms, there is a natural

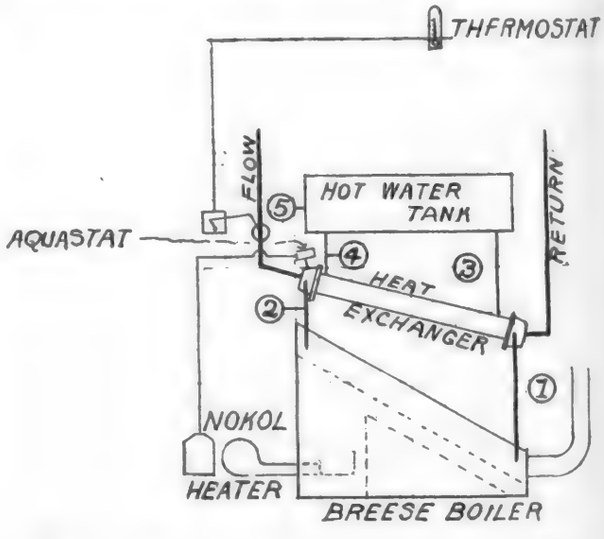

Fig. 1. Arrangement of Heat Exchanger in Boiler

flow of hot water from the boiler to the house which returns to the lower end of the boiler exactly as usual. The return, however, passes through the lower head of the heat exchanger so that the heat exchanger itself may be said to be a by-pass or short circuit between the flow and return pipes.

When the butterfly valve is shut by the regulator it blocks up the flow pipe and the water from the boiler is compelled to pass through the heat exchanger to the lower end of the boiler. The moment this occurs it starts to give up its heat to the water surrounding the tubes and this sets up an unbalanced condition in the hot water tank system

and heated water starts to rise from the upper end of the heat exchanger through pipe No. 4 to the tank.

This operation continues until the temperature of the water at the aquastat has reached the critical point, when the aquastat operates and shuts off the NoKol.

Now should someone draw off some hot water its place is taken by cold water from outside which naturally falls to the bottom of the tank and finds its way by return pipe No. 3 to the heat exchanger. the boiler which goes up the flow pipe and is replaced immediately by cold water from the return pipe. It takes just about one minute for enough water to flow into the system to affect the aquastat which starts the NoKol. This runs until the house is warmed; then the thermostat closes the butterfly valve, thus throwing the hot water from the boiler through the heat exchanger and just as soon as the temperature at the aquastat has reached the critical point, it stops the NoKol.

Thus we see that both the house and the water

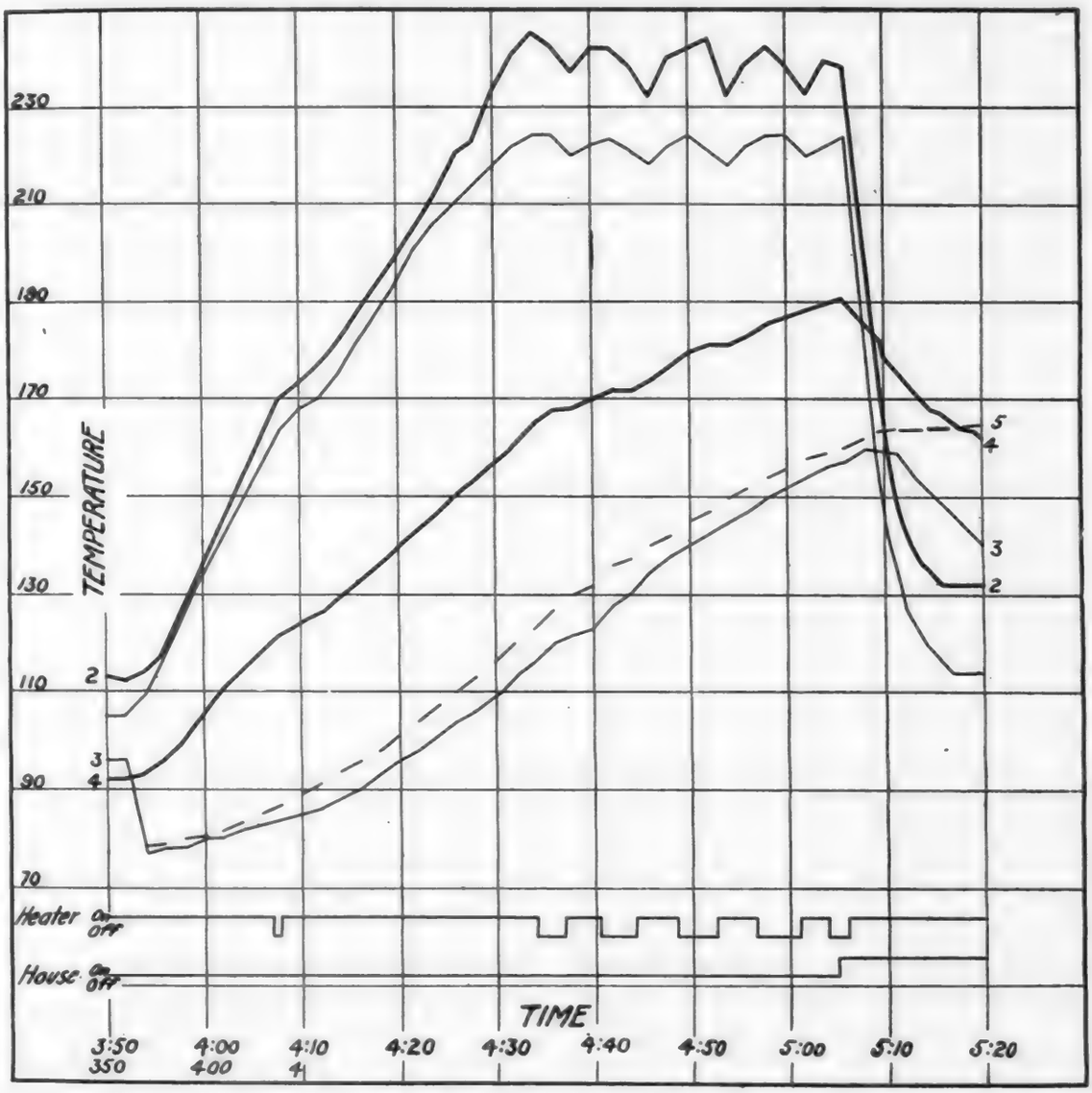

Fig. 2. Result of Heat Exchanger Tests

If the quantity drawn off is sufficient to replace the volume of water contained in the exchanger, the temperature in the aquastat is lowered and the NoKol heater runs until the temperature is restored.

CONDITIONS WHEN TANK IS HOT AND HOUSE COOLS

Now supposing the tank is hot and everything is standing still. The house cools off to a point where the regulator opens the butterfly valve in the flow pipe. This instantly releases the water in tank are automatically kept at an even temperature at all times. We not only can keep the house within one degree of a given point regardless of outside weather conditions, but we have a tank full of 160° water at all times, regardless of how much we use. The capacity of the heater and the heat exchanger is such that if the entire tank should be drained and replaced with cold water it would be reheated to 160° in an hour and would be heated to 130° in about three quarters of an hour.

Commenting on the character of the top of the curve No. 2, which is the temperature of the flow from the boiler, I may say that this test was made with uncovered pipes and the radiation from the pipes was such that the very sensitive aquastat operated about every five minutes. This is shown by the line representing the heater operation at the bottom of the chart. Of course, the time in which the water at the aquastat cools down one degree is purely a function of the insulation. I am putting a double layer of insulation on all of this piping and I anticipate that I can cut down the radiation to such a point that the NoKol will operate not more than once an hour and then only for a few minutes.

EXPLANATION OF CHART

Referring to the chart (Fig. 2) curve No. 1 is the temperature of the return water from the house. Curve No. 2 is the temperature of the flow water so that the vertical distance between these two curves at any point indicates the increase in temperature caused by the passage of the water through the boiler. The relatively slight increase indicates a rapid flow of water through the boiler. People have commented many times on the small size of the boiler in comparison with the house, but I can say that I am heating 50,000 cu. ft. of space to a temperature of 70° F. even though the thermometer is below zero outside and still have a very considerable margin of boiler capacity to spare. This boiler is built up of six 60 in. sections and contains 66 sq. ft. of heating surface. The NoKol burner is operating now at a rate of 1.65 gal. of oil per hour.

Curve No. 3 is the temperature of the return water from the tank and curve No. 4 is the temperature of the flow water to the tank. The vertical difference between these two curves at any point indicates the increase in temperature of the domestic water supply caused by its passages through the heat exchanger. The average increase is 40°.

The vertical distance between curves No. 1 and No. 3, of course, indicates the temperature difference between the two streams of water at the lower end of the exchanger, and the corresponding distance between curves No. 2 and No. 4 indicates the difference between the two temperatures at the upper end of the exchanger.

Inasmuch as these temperatures tend to equalize, it would seem that a longer exchanger, providing an increased time element, would discharge water close to the temperature of the boiler water, thus giving an extremely close control and effective interchange of heat.

Curve No. 5 is the temperature of the hot water in the tank at the middle point. I have a house which provides about 31 ft. of head, so that I do not reach the boiling point until the water temperature is around 250°. The sudden drop at the right hand side of these curves was caused by the butterfly valve opening. The effect on the entire system was immediate and continued until the temperature had settled down to about 132° on the flow side, after which time the temperature gradually built up as the house warmed, until a temperature of around 145° was reached. The house had then recovered the one degree necessary to operate the thermostat.

In the summer I anticipate simply throwing the thermostat down to a low point which will put it out of commission and the butterfly valve will remain closed; then the NoKol will simply operate when the hot water tank needs it.

With 8½c oil it costs me 25c to heat 100 gal. of water from 78° to 160° F.

Jointless Heating System for a Modern Manufacturing Plant

(*Continued from Page* 55)

pipe supplied had threads on the ends, possibly because it was easier to obtain from stock than pipe with ends ready beveled for welding. This occasionally happens but never holds up work because the cutting blowpipe affords a ready means of slicing off the threaded ends, and making a beveled end all at one stroke. Fig. 3 shows an operator cutting a pipe just back of the thread protector.

After each pair of single lengths had been oxwelded, they were hoisted to position and swung in pipe hangers. (Fig. 5). Then the tie-in joints were made from ladders. A neat, strong and leakproof heating installation was the result, thoroughly in keeping with the latest ideas incorporated in all departments of this factory.

Home-Study Heating Course — Lesson No. 6

(*Continued from Page* 65)

H-1-6. It is sometimes quite desirable to increase the size of mains slightly and use the smallest possible riser for the sake of appearance especially where pipes are to be run exposed to save expense as in the case of many old house installations. The student should bear this in mind for such conditions.

Work Problem H-1-17

The second lesson in the water-heating section, to appear next month, will include pipe sizing by valve areas, consideration and importance of styles of branch connections, use of eccentric fitting and application of principles covered in this lesson with respect to complete two-pipe up-feed system.

Heating and Ventilating the United States Capitol

The Three Methods Successively Adopted to Date for Furnishing Heat and Fresh Air to the House and Senate Wings

By S Homer Woodbridge

2. The Second Heating System Installed in the House and Senate Wings

A DESCRIPTION has heretofore been given of the heaters first designed for and installed within the north and south wings of the United States Capitol, and of the defects in design as they became manifest in the practical working of the system, and of final failure in intended service, principally due to the large and unreliable human factor involved in the operating problem.

Those pipe heaters were divided vertically into a total of some 420 trombone section elements grouped into approximately 60 heaters located in widely separated positions in the sub-basements of both wings, each section element being provided with key-operated steam and condensate valves, all covered in behind heavy cast-iron doors hinged to swing horizontally in a manner not conducive to ease of access to the valves, especially to the steam valves aloft.

Added to faults in design and to difficulties attending manipulation of the valves of widely-distributed heaters, in many cases located and environed without reference to accessibility, was the failure to temper outside air driven by fan action through the heaters, a failure which resulted in such continuous damage from the freezing of the lower pipes of many heaters due to leakage through closed steam valves under the relatively high pressures carried that valve manipulation was almost of necessity abandoned. For the protection of heaters all valves were kept open more or less continuously. The air which passed through them became superheated and the Capitol assumed so much of a hot-house condition as to suffer in reputation for its closeness and stuffiness and generally over-heated condition, the ventilation being inversely proportional to temperature of air supply.

MULTIPLE AND VERTICAL DIVISIONS OF HEATERS CHANGED TO THREE HORIZONTAL DIVISIONS

Such being the situation in 1902, the consulting engineer in charge effected a revolution which changed all heaters from a type of multiple and vertical divisions to three horizontal divisions for each heater. This change included a reduction in valve manipulation from some 420 valves in each wing to three valves located on the switch board in the office of the operating engineer, and also provision for warming the air delivered by supply fans to any degree desired for the protection of the heaters, and for supplementing the thermal work of the secondary heaters.

The secondary heaters were designed to fit into and occupy the brick-walled chambers which housed the original heaters, from which approximately 12 miles of 1-in. piping was removed. Each new heater was made up of 1-in. pipe and in three horizontal sections of box form, all pipes of each section connecting, for steam, into a horizontal cast-iron manifold, and, for condensate, into a similar manifold of like size and pattern. At the steam connection of all pipes with their manifolds was placed a brass bushing bored to provide a ¼ in. diameter orifice for steam admission to the trombone pipe formation making up the elements of each section. The orifice effected an equalization of steam flow to all elements connected into each steam manifold, and also prevented by that functioning the air binding very common and equally troublesome in heaters lacking provision for equalizing steam flow from manifolds into connecting branch piping.

The three sections making up each heater were given unequal surface values, for the most part in the ratios of 2, 3 and 4, and for others in ratios of 3, 4, 5. That is, in case of a heater made up of twelve branch manifolds, the uppermost section "A" would be twelve pipes wide, and either four or five pipes deep; the intermediate section "B," twelve pipes wide and either three or four pipes deep; the bottom section, "C," twelve pipes wide and either two or three pipes deep. The lengths of pipe making up the sections were as variable as the corresponding dimensions of the chambers for accommodating the heaters. The manner chosen for making up the heaters gave to them a range and flexibility of thermal output, represented in the case of surface ratios 2, 3, 4, by 2, 3, 4, 5, 6, 7, 9, according to single sections or combinations of sections steam-filled. Similarly for the 3, 4, 5 ratio type of heaters the thermal range and flexibility are represented in like manner, by 3, 4, 5, 7, 8, 9.

VALVE MANIPULATION FOR EACH WING REDUCED FROM 420 TO 3

Because correct use of a heating system varies inversely as the amount of attention, and especially

of valve manipulation required, the designer's plan reduced valve manipulation for each wing from 420, or more, to 3, and placed those three valves on the switch board in the office of the master engineer. For that purpose all valves controlling steam flow to the heaters were made to operate by pneumatic action. All valves of the A series of heater sections were connected by means of small air piping with a three-way air cock in the engineer's quarters in such manner that a throw of the three-way cock switch in one direction put air pressure on the diaphragms of all the A series of steam valves within each wing, and closed them. A throw of the switch in the opposite direction released the compressed air from above the diaphragms of all those valves, the valves opening under the action of strong springs, so admitting steam to all the A series of heater sections in the wing affected.

All the B series and all the C series of all heaters were likewise each provided with pneumatically-actuated valves, air-pipe lines and switches, so that by means of three switches steam could be simultaneously admitted to, or shut off from either the A, B or C sections of the entire wing, or any combination within the limits of the arrangement of sections could be made simultaneously throughout each wing.

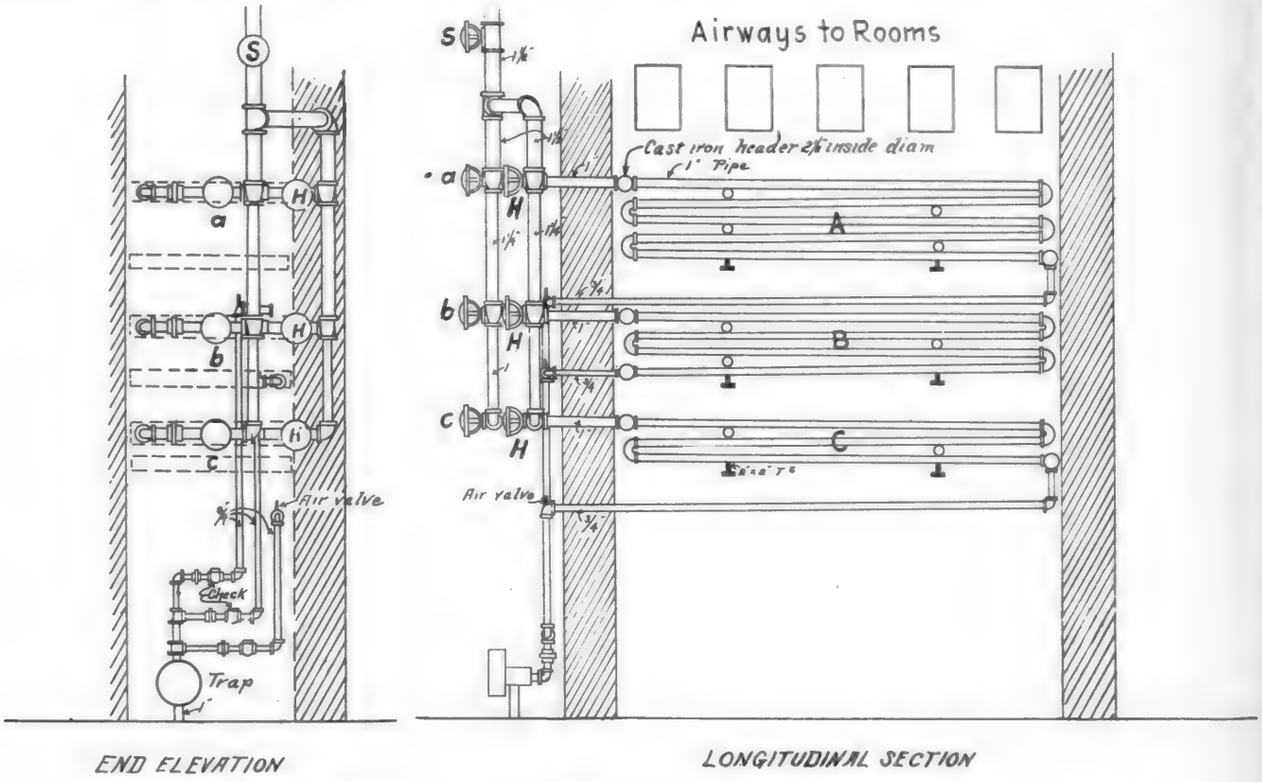

Fig. 1. General Method of Piping and Valving Heaters for Senate Wing

SUPPLEMENTARY SYSTEM OF INDIVIDUAL HEATER CONTROL

In providing for the Senate, or north wing, consideration was given to the generally more advanced age of room occupants, to the more privileged and autocratic demands supposed to be the prerogative of members of the upper branch, and to the greater weather exposure of the north wing to cold winds and heatless northern light. The morning arrival of members chilled and dampened by cold and wet storm, to find rooms unwarmed either because of windows left open during night, or of a warm-air register valve left tight closed over night, or, in some cases, because of extra heat needed, due to temporary or chronic lowering of vitality,—such not improbable situations seemed to justify the costs of a supplementary system for providing complete individual control of heaters serving this wing, such as to make possible the steam filling of all three sections, A, B, C, of any heater connected with rooms, the heating of which might require acceleration.

Such provision made necessary an individual air-pipe line from the switchboard to each of the score or more heaters serving the wing, and such adaptation to, and modification of, each heater valving so that steam could be made to fill all of the sections making up each heater, and without reference to the number of sections steam filled in any or all other heaters of the same wing. The plan involved the running of single lines of air pipe from the switchboard to each nearer and farther distant heater, and a corresponding array of switches at the board, giving an appearance of complexity to an otherwise notably simple system.

The general method of piping and valving at the heaters to effect the end sought in the case of the Senate wing heaters is shown in the accompanying

illustration in which A, B, C represent heater sections, S, the steam pipe; and a, b, c, diaphragm valves for the individual control of steam flow to corresponding heater sections A, B, C, each valve being independently connected by pipe line with the switchboard three-way cock. Valves H control the simultaneous flow of steam to all three sections, and are themselves controlled by air actuation through independent air piping separate for each heater and each controlled by a separate three-way air cock. When valves H open steam is admitted simultaneously to all three sections of the heater affected, and the connected rooms are quickly brought to the desired temperature, after which the heater may be brought under the A, B, C, control in common with all other heaters of the wing.

SYSTEM AS DESCRIBED IN USE OVER TWENTY YEARS

The system as outlined has been in use in the Senate wing for the past twenty or more years. The House wing equipment did not include the H outfit of piping and valving. The congenial personal temperament of the chief engineer of the House wing proved unsympathetic with, or at least unappreciative of, the purpose and fitness of the "new-fangled" device for labor-saving and temperature control. Furthermore, this wing being without the Senate wing auxiliary for furnishing on demand extra heat to this or that section of the building calling for it, except by increasing all flue temperatures, the system as furnished for the House wing finally fell into disuse, with reversion to hand control of some 70 widely-scattered sectional steam valves, and with building temperature results approaching, though not reaching, those prevailing under conditions described as incident to, if not inevitably resulting

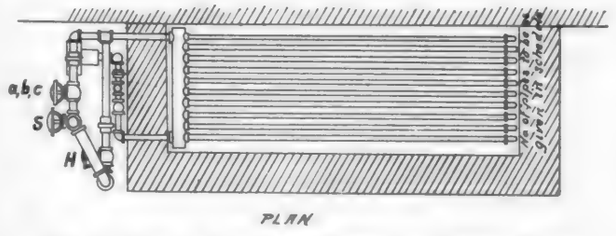

Fig. 2.—Plan of Indirect Heater for Senate Wing

from, the character of the heaters described in the preceding paper. (See March issue.)

ORIGINAL FAN SYSTEM REPLACED BY MODERN EQUIPMENT

A further change from the original to the modified form of heating involved the retirement from service of the original Briggs-Meigs fans for supplying air to the wings through the heaters. Those fans, of highly efficient design, were driven by single and vertical direct-connected steam engines, whose action was that of fascinating and stately simplicity and quiet dignity. The thought of removing and destroying those long-time faithful, silent graceful servants smote the evoluting engineer with a lingering sense of rebuking regret not yet extinct. The engines and fans were fine specimens of skilled and conscientious workmanship, and their rythmic motion had in it the spell of stately poetry. The makers of the engine, if not the fans, were Hettinger and Cook of Charlestown, Mass. The fans were of single-inlet cone-type of 12 ft. diameter, of cyloidal type of blades; the cone a massive solid casting of gracefully curved form. The great discs carrying the blades were made of heavy radial staves of mahogany secured to the cones and rigidly tongued and grooved together.

The bulkiness of these fans, the heavy carrying

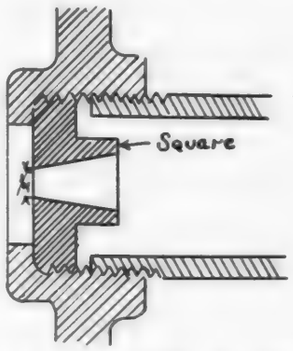

Fig. 3. Detail of Brass Bushings in Outlets of Supply Headers

walls with their curved forms of air-way approach to fan inlets, the spaces required for the engines, all combined to make impracticable any plan for placing where wanted adequate air-tempering heaters for service in combination with the fans as found. Therefore the historic fans were condemned to destruction, as also the engines and the walls, and room was made for smaller fans of steel construction, for higher rotary speed and as much, if not larger air moving capacity, and for direct, connected electric motor drive, leaving space for air-tempering heaters.

ARRANGEMENT OF AIR-TEMPERING HEATERS

These were made up of 1-in. pipe assembled in gridiron construction, the pipes spaced 2½ in. centers, and ranging seven pipes deep in the direction of air flow, the principal pipes being vertical, with expansion pieces at top. Each heater presented a wall 17½ ft. long and averaged 12 ft. in height, providing 850 sq. ft. of surface to each 1,000,000 cu. ft. of air flow an hour, with heating capacity sufficient to raise that volume of air from an initial temperature of 0° to a final of 70° F., with a maximum steam pressure of 15 lbs. and an air flow velocity of 600 ft. per minute through the heaters.

ORIFICE METHOD APPLIED TO HEATERS

The orifice method of insuring equality of steam flow to the fourteen pipes connected into each manifold, or header, was applied to these heaters.

(Continued on Page 75)

Back to First Principles

Plain Answers to Direct Questions on Present-Day Heating and Ventilating Practice

By T. W. Reynolds

(*Continued from the January issue*)

Circulating Water Below Its Heating Source Without Mechanical Means

IF we meet with a problem as shown in Fig. 48 the water from the heater should be run up first to the expansion tank before supplying the radiators. This tank, of course, is provided for the expansion of water, but due to its location all air in the system will tend to vent at this high point rather than drop to the lower level of the flow main.

Now assume a condition, as sometimes happens, where it is undesirable to run the return along the floor. In such a case circulation can still be maintained by arranging the piping as shown in Fig. 49 with a separate return from an upper-floor radiator run, first, as a supply to a basement radiator, then as a return from this radiator up and back to the heater by means of an overhead main, bypassing the basement radiator as shown, if so desired.

ONE OF THE MOST DIFFICULT PROBLEMS IN WATER CIRCULATION, ENCOUNTERED IN SHANGHAI, CHINA

One of the most interesting problems along the lines treated herein was described by Harold L. Alt (See Jour. Am. Soc. of Heat.-Vent. Engineers, May, 1921) as encountered in his work on a heating system for a bank in Shanghai, China. The theory of circulation is apparent from a study of Fig. 50; the water in the supply drops to the radiators being cooler than in the main riser from the boiler and the water in the return drop at the heater being cooler than in the return risers from the radiators, this difference in temperature being usually sufficient to circulate water from heater to radiators unless a system is quite extensive.

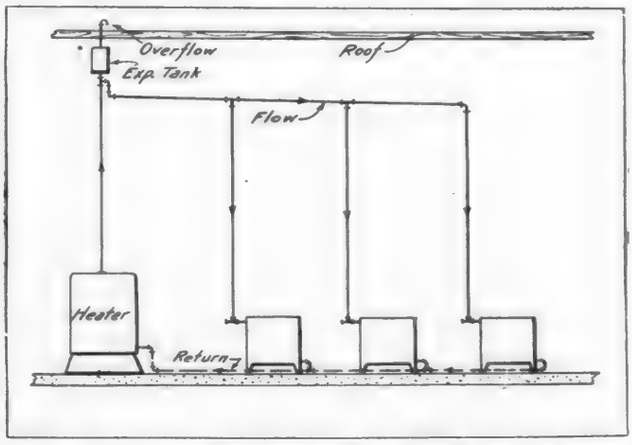

Fig. 48. How The Expansion Tank May be Used For Air Removal Where There Are No Radiators Available For This Purpose

Air venting is accomplished as shown in the sketch, one air-line being connected to the supply header at the high point and another similarly connected to the return header. Each vent line is carried up to the expansion tank and connected so as to avoid short-circuiting from supply to return, as would be liable to occur if connected below the water-line. All radiator drops are taken from the side or bottom of the mains to eliminate the necessity of venting high points of connections as otherwise made from the top.

In operation the system was not entirely satisfactory. Some of the difficulties peculiar to the ordinary heating system were here just reversed. Radiators near the heater which in the usual heating system are apt to short-circuit and be too hot were in this case cold or only lukewarm while those further away, which are often cold, were too hot. Without doubt this was due to the natural tendency of the hotter water to cling to the top of the main. This hotter water would then flow to the end of the main and passing down through the last radiator would flow back through the overhead return to

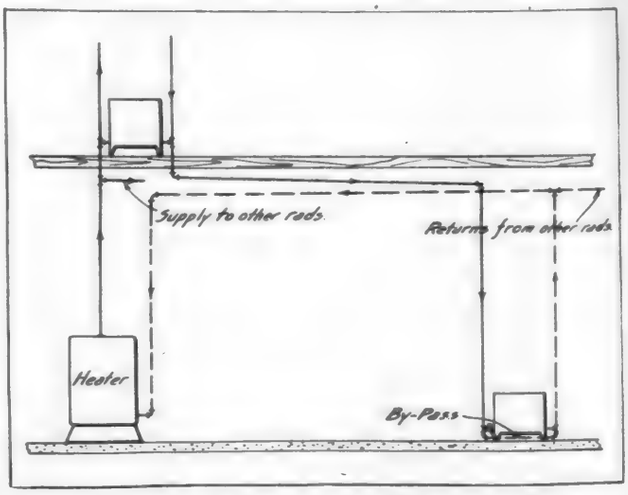

Fig. 49. How The Return From A Basement Radiator May be Run Overhead To The Heater

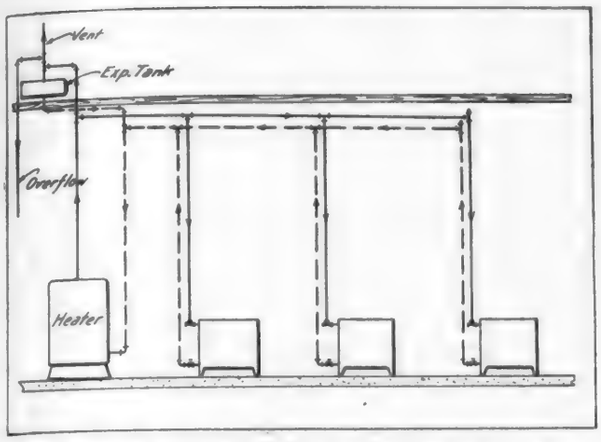

Fig. 50. An Especially Difficult Problem In Water Circulation Encountered In Shanghai, China

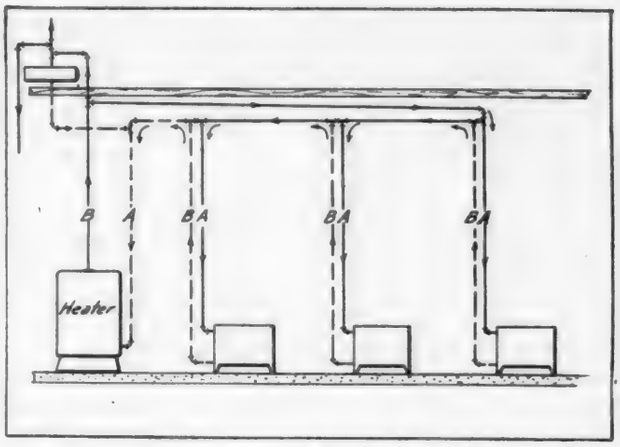

Fig. 51. Arrangement Of Piping Recommended For Eliminating Difficulties As Described In Connection With Fig. 50

the boiler, by-passing all radiators at points between.

In the discussion which followed the reading of this paper it was pointed out that better results might have been secured if the system had been run under a few pounds pressure with a safety valve on it, or if all the water from the boiler had been run first to the expansion tank before supplying any radiators. Perhaps the most interesting side of the discussion were the remarks by L. W. Moon who described an installation where the conditions were somewhat similar but where the results were more satisfactory. Though the radiators nearer the boiler were slightly cooler than those farther from the boiler, just as related by Mr. Alt from his own experience, nevertheless all radiators between these points were as hot as could be desired. The reason for this will become apparent by a study of Fig. 51, a sketch made according to Mr. Moon's description.

As shown in this sketch, the farthest radiator was supplied first and the nearest radiator supplied last, the water being forced to make a continuous circulation from the main to the last radiator up and down through each radiator in turn. In this case the theory of circulation is that the water cooling in the supply drop to a radiator, as at "A," lowers and allows the hotter water in the return riser immediately preceding it to rise, as at "B." Of course, every other tee in the main was plugged to prevent circulation through it. Each plug, however, had a 1/8 in. hole drilled through it in order to vent the main.

WATER HEATING PROBLEMS IN CONNECTION WITH GARAGES SET LOWER THAN THE HOUSE HEATER

In the heating of garages from a heater in a dwelling it often happens that the garage is below the level of the heater, or again that the flow main must drop in order to run below ground to the garage. In such cases the treatment of the problem is similar in principle to the foregoing examples, several return risers from upper floors being connected together and run as a supply to the garage, an example of such a condition being shown in Fig. 52.

In some cases this problem may be handled as shown in Fig. 53, taking a pipe coil or other radiating surface and placing it at the ceiling near the doors where it will be especially active as a cooling surface. This will start circulation through the radiator below because the weight of water in the supply pipe to the radiator is increased as it is cooled in the pipe coil. Of course, the circulation will also increase with each increase in elevation

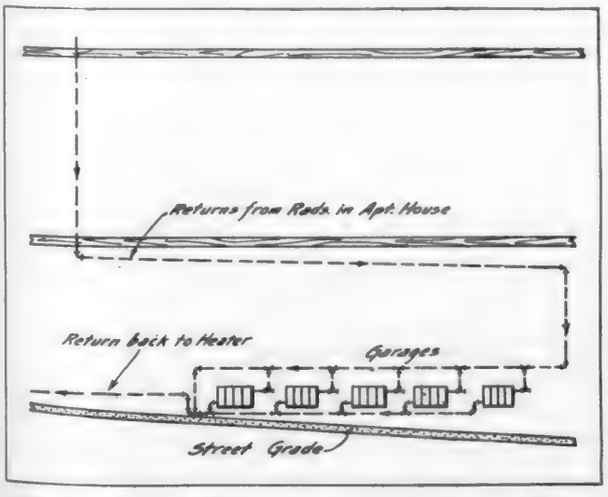

Fig. 52. Method Of Heating Used For Garages When Set Lower Than The House Heater

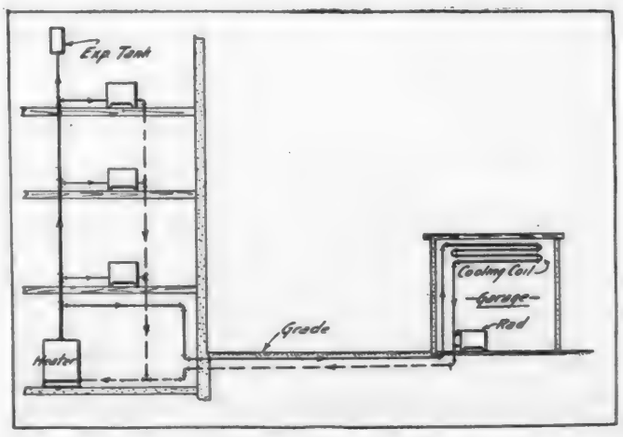

Fig. 53. Alternative Arrangement For Increasing Circulation In Garage Radiators

of the coil above the radiator. It should also be pointed out that the use of a cooling coil is suggested only where some other method of establishing circulation cannot be conveniently used, as the coil radiates heat at a point where it is not wanted for heating purposes.

Still other problems in garage heating might be shown, but as this is a subject in itself, it will be sufficient at this time to refer the reader to the several kinds of garage heating problems as set forth in THE HEATING AND VENTILATING MAGAZINE for June, 1921.

Connecting Returns to Heating Boilers Without the Use of Check Valves

Q. 46. Ten boilers operated under my supervision as chief engineer of boiler plant equipment in a number of schools deliver wet steam to the heating systems throughout these buildings. This occurs whenever the stop valve of a boiler is closed, as well as at other times, and is due in my opinion to the lack of check valves in the return connections.

If check valves were installed I could effect a saving of 12 tons of coal per heating season, using an equalizing pipe connected in each case at the return end on the system side of the check valve, the arrangement to be correctly made as shown (in Fig. 54) rather than as shown (in Fig. 55) which I think is wrong. Equalizing lines are now connected at the supply end from the system side of stop valves to return lines. Incidentally, I would like to know of what benefit an equalizing line is to a two-pipe heating system. On a one-pipe system they may be required.

A. The above question from a western correspondent, abbreviated, but given in substance as received, arrived in time to be incorporated along with sketches then being prepared of equalizing, drip and other pipe connections for steam heating boilers. This is a subject which has awakened considerable interest of late among heating engineers, and it may be said that the matter of equalizing lines has been often misunderstood, resulting in water-logged heating systems and even in cracked boilers.

More often than not this so-called equalizing line has been in reality merely a drip line, draining the steam header at the boiler to the return line, equalizing nothing, but preventing an unsteady waterline through the interception of water carried over from the boiler and returning such water immediately to the boiler by way of the drip and its return connection.

If we want to equalize or balance pressures in the return header we must pipe steam directly from the boilers to above the water-line in the return header at the boiler, but of this more hereafter. Meanwhile, it may be well, first to present in logical order the cause of water backing out of the boiler, how check valves may be used so as to prevent this backward flow; then, how check valves are not needed after all if we use some other and better method; and finally, when and how equalizing pipes really equalize and what points should be carefully observed in making such connections.

ADVANTAGES AND DISADVANTAGES OF CHECK VALVES AT BOILER-RETURN CONNECTIONS

In long wet returns check valves add a feature of safety, preventing the boilers from emptying should a break occur in the returns, but aside from this we need check valves in the returns in order to stop the backward flow of water from the boilers whenever the boiler pressure is raised, or the pressure in the returns lowered.

This tendency to backward flow reaches a maximum at the time the system is heating up, at which time the building and radiating surfaces are cold. The large amount of condensation resulting from this produces a certain amount of vacuum in points of the system farthest from the boiler; in other words, causes a difference in pressure between the pressure in the boiler and that in the return. As a consequence, the steam pressure within the boiler, acting upon the water, pushes the water from the boiler, providing there is no check valve on the return. Should there be one, then the flapper of the check valve is closed by the boiler pressure acting downward upon the water.

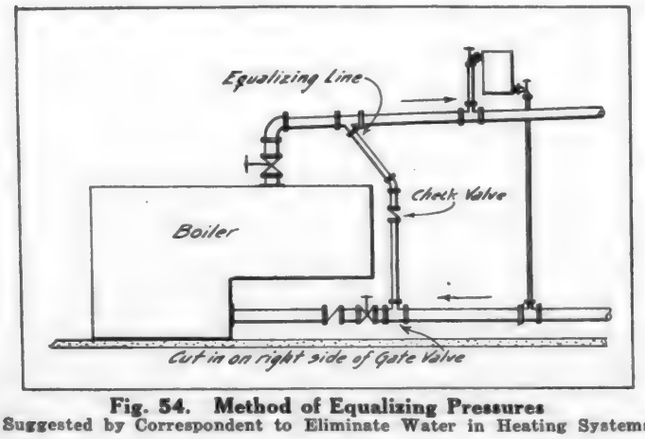

Fig. 54. Method of Equalizing Pressures
Suggested by Correspondent to Eliminate Water in Heating Systems

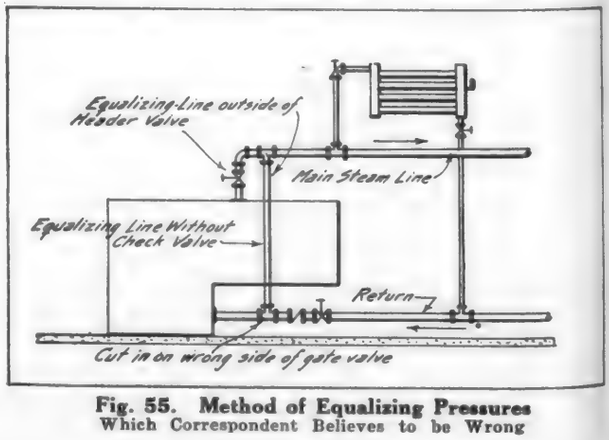
Equalizing Line outside of Header Valve
Main Steam Line
Equalizing Line Without Check Valve
Return
Cut in on wrong side of gate valve

Fig. 55. Method of Equalizing Pressures
Which Correspondent Believes to be Wrong

In this way the water is retained within the boiler, but unfortunately the closed check prevents the return of condensate from the system until such time as the condensation discharged from the radiators builds up a head of water in the returns back of the check valve sufficiently high above boiler water-line to overcome the pressure differential and return the water to the boiler. As this operation takes a considerable length of time, especially when the system is heating up from cold, the large amount of water retained or held up in the system may lower the boiler water-line to the danger point with resulting damage, as boiler sections becoming overheated are cracked.

Of course, there is at all times some difference in pressure between the boiler pressure and that at the ends of the system, else steam would not flow to such parts. This difference in pressure comes about not only because of the steam condensing faster than it can be replaced by additional steam from

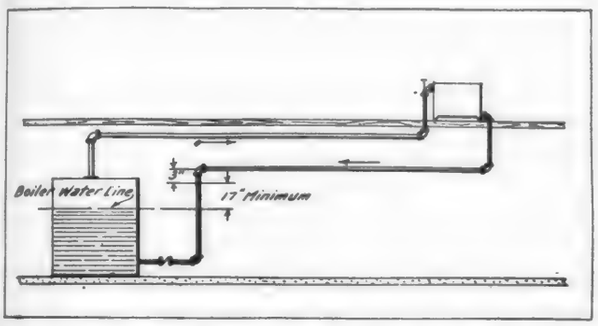

Fig. 56. How Water Rises in Returns Until Pressure Produced by its Height Balances Boiler Pressure

the boiler, as previously outlined for a cold system, but also because of the friction produced by the flow of steam as it changes its direction at elbows and tees, rubs over the inner surfaces of pipe and fittings and jumps over ends of abutting pipe lengths—ends which quite often are either poorly reamed or not at all. Furthermore, the friction increases as the flow of steam increases, hence the friction would be greatest when the system is cold.

Energy must be given up by the steam in order to overcome this friction and produce a flow to the points desired,—this energy is called the pressure drop. Experience has proven a pressure drop of about 10-oz. to be correct for gravity systems, so that such systems are usually sized on the basis of a 10-oz. drop. Knowing that a column of water 27 in. high will produce a pressure at its base of 1 lb. per square inch we find that a 10-oz. pressure differential will hold up a column of water 17 in. high, hence this is the minimum height of the lowest point of the dry return above the boiler water-line—much more is desirable (See illustration in Fig. 56).

Check valves add considerably to the friction, a difference in pressure being required each side of a check valve of at least 1¾ oz. before the flapper of the valve will swing open. This will cause the water to stand 3 in. higher in the returns than the point shown in Fig. 56. It is for this reason that only check valves having vertical hanging seats should be used, instead of those with seat at 45°. As the check valves deteriorate in service, even more than 3 in. is often required to lift the seat.

From the previous remarks, it will be seen that in the problem submitted (Fig. 54-55) neither arrangement is correct. If true boiler pressure is to act upon the return water the so-called equalizing pipe must not reduce this pressure by insufficient size or too many turns. It should be short and as direct as possible and, most important of all, should never be fitted with a check valve as shown in Fig. 54. This adds to the friction, as just explained.

Fig. 54 is also open to criticism, more particularly because of the drip pipe admitting boiler pressure to the system side of the check valve, thus causing the water to back up in the system especially when it is heating up from cold, at which time the pressure differential is greatest.

Check valves are also required where more than one boiler is connected to the same return header. One must be placed in the return of each boiler, otherwise water would back from one boiler into another due to pressure differences occasioned by each boiler evaporating at a different rate. But even with individual check valves there are difficulties in operation, for, as the return pressure opens the check valve of one boiler, the return water will flow into that boiler to the neglect of some other. The several check valves will not operate simultaneously, hence an unsteady water-line results.

(To be continued)

Heating and Ventilating the U. S. Capitol

(Continued from Page 69)

One section out of each seven was placed under thermostatic control, the other six being provided with pneumatic diaphragm valves for actuation from the engineer's switchboard. Telethermometer indicators, with reading dials on the same board, showed at all times the temperatures of air drawn to, and of that drawn through, the heaters and fans. The manipulation of the three-way cock controlling lever was governed in accordance with the reading of these dials.

After some twenty years of use both the primary and the secondary heaters above described began to fail through the corrosion of the steel pipe, and especially of nipples, where made into cast-iron manifolds and fittings. Renewal or replacement appearing necessary, the seemingly ideal design and construction of but a score of years past were in turn condemned, and a new and third type of heaters, and method of temperature control, were proposed of entirely new design. The third system in the order of equipment, now installed and in use, will be the subject of a subsequent paper.

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DEVELOPMENTS in the domestic oil-burning field, as revealed in a survey just completed by THE HEATING AND VENTILATING MAGAZINE lead inevitably to the conclusion that, irrespective of what heating men may think of this new industry, it has already passed beyond its childhood stage, and is swinging onward at a rate little appreciated by the rank and file of the profession.

It was only a few years ago that the heating of residences by means of oil was practically unheard of, except in the oil sections of the Far and Middle West. The growth of this new industry, particularly during the past three or four years has been little short of phenomenal. It has been taken up with characteristic American energy and forced as only Americans could force such a development.

But irrespective of the way the industry has been developed, it is useless to ignore the fact that domestic oil heating is a settled reality, and not a dream of the future. At the same time the conditions within the industry are frankly chaotic. There are makes of burners not yet out of their swaddling clothes, and some so undeveloped that they should not be offered to the home owner. But was this not true of nearly all appliances in common use today, when they were first placed on the market? To take an up-to-the-minute example, witness the radio and the automobile.

Let us then take stock of this growing field of endeavor. What does it vision when viewed without bias? What promises can it fulfill, and what are its limitations? What is its place in the economy of the nation?

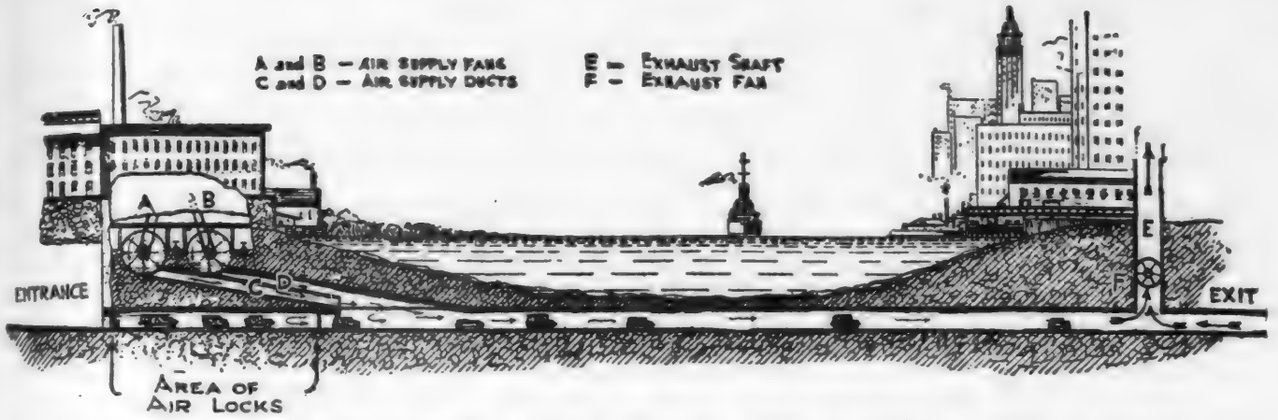
From the analytical study of the situation, already referred to, the oil-burner industry under wise guidance, may be expected to provide a type of oil-burning outfit for every class of home. This does not mean that an oil burner will provide warm rooms where it has not been possible with coal, nor that they will give satisfaction if improperly installed. It must be frankly recognized, in addition, that intelligent inspection at frequent intervals will continue to be necessary. This and the fact that oil burners must be fed with clean fuel of the proper, and as far as possible, uniform grade are perhaps the two most important requirements developed by the survey.

A STUDY of practically all of the oil-burner literature extant brings out the fact that most of it is overloaded with superlative descriptions and claims of perfection which cannot honestly be demonstrated. Few, indeed, are the dispassionate statements of what a burner will do and what it will not. Again, it is evident that many oil-burner manufacturers do not realize the futility, not to use a stronger word, of secreting facts regarding their products. The plain folly of such a policy is appreciated when it is realized that anyone may buy one of these burners on the open market and in relatively a few hours possess himself of all the dimensional and other data desired.

A further thought is the interlocking of the oil-burner business itself with the problem of oil production, and distribution. Of what use, for example, is an oil-burner if proper fuel may not be had at a commensurate price? As a matter of fact, the increase in sales of burners has kept the oil producers and distributors moving at a high rate of speed and only about a jump ahead. Manifestly too high a rate of growth, then, may defeat the very ends of the manufacturers, who will actually arouse the ire of the oil men through the sale of more burners than can be supplied with fuel. "Demand and supply" will always determine cost of fuel. A sudden and material rise of fuel cost would be the beginning of a reflex that would put the oil-burner business in a bad way.

Obviously a wide horizon spreads before us for the development of burners for lower grades of oil, say 24° to 30° Baume, or A. P. I., as we now know it. Such fuels are not suitable for the present average type of domestic burner, and the development of burners to successfully use these grades would entirely change the complexion of the situation.

HEREAFTER THE HEATING AND VENTILATING MAGAZINE'S data sheets, which have appeared regularly in these columns for several years, will be published in a new form. Instead of being backed up on four pages, they, will be published two to a page, printed on one side only, and of the exact size to be clipped and placed with those already separately published.



Elevation of Holland Vehicular Tunnel Showing Ventilation Scheme Advocated by James M. Seymour.

Flushing System Advocated for Ventilating Holland Vehicular Tunnel

ALTHOUGH the plans for ventilating the Holland Vehicular Tunnel between Jersey City and New York, have been adopted in their present form, it is recognized that actual operating conditions in the tunnel itself will have to be relied upon to furnish the "proof of the pudding." For this reason, the tunnel engineers have been careful to state that "we intend to know, before we open these tunnels to traffic (probably in the Fall of 1926) exactly what is going to happen under the worst possible conditions."

In the meantime, James M. Seymour, a well-known consulting heating and ventilating engineer and fan manufacturer, of Newark, N. J., has come out in the *Newark Evening News* with a detailed discussion of what he considers the limitations of the present plan, especially in connection with the fire hazard and operating cost. As an alternative to the present scheme, which he designates a "dilution" system, Mr. Seymour urges the substitution of a "flushing" system and shows how such an arrangement would not only reduce the fire risk, but would permit great economies in operation.

As is well known, the system of ventilation adopted for the Holland Vehicular Tunnel connecting Jersey City and New York, is the so-called upward system, with the air intakes at the roadway level and the outlets at the ceiling level, spaced 15 feet apart.

Mr. Seymour points out what he considers the defects of this arrangement and proposes a "flushing" system, on the ground of reduced fire risk and lower operating cost.

At the outset of his discussion, Mr. Seymour is frank to say that "if the system planned for the Holland tunnels is carried out, I have no doubt that the tubes will be reasonably safe when their condition is normal, no accidents, no fires, and a clear, dry atmosphere."

NEW HAZARD INTRODUCED WITH ADVENT OF ETHYL GASOLINE

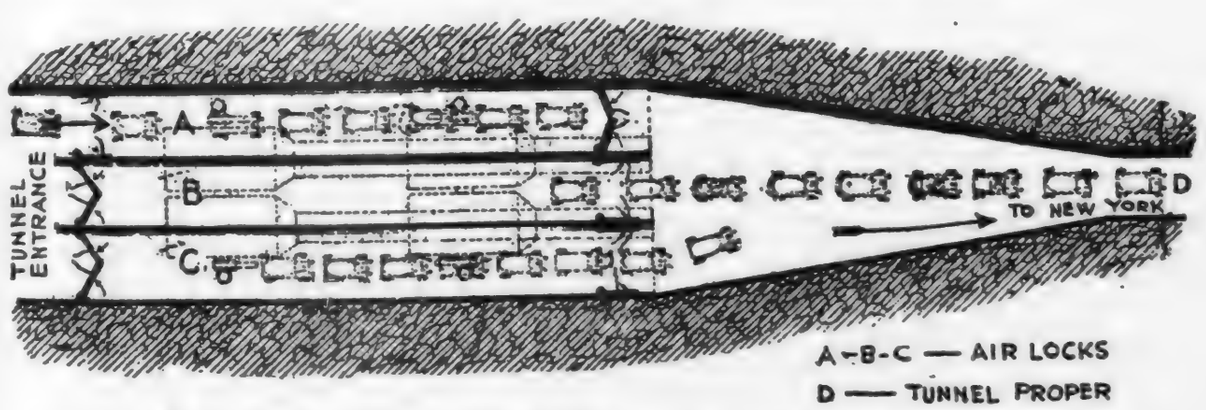
"With the advent of ethyl gasoline," continues Mr. Seymour, "a new danger is added to the already serious danger produced by the exhaust from automobiles using ordinary gasoline.

NOT VENTILATION, BUT DILUTION

"The method of ventilating the tunnel to which the commission is definitely committed is to force the air in, delivering jets of air near the floor or driveway and exhausting it again from the top of the tunnel through small openings in a large flue to be constructed in the tunnel—a system that does not ventilate but dilutes without flushing, and it is a well-known fact that even a short tunnel or tube cannot be properly ventilated without both dilution and flushing.

"The designers of the ventilating system for the vehicular tunnel seem to have cast to the winds all the experience of mine ventilation that has been gained during the last half century, and have adopted a system similar to the systems ordinarily installed in auditoriums where there is nothing to be accomplished but the regulation of temperature or the removal of exhalations from human bodies.

"The system of dilution to which the commissioners are committed is the most wasteful and inefficient system that could possibly have been adopted —wasteful in power and inefficient in results obtained.



Plan of Holland Vehicular Tunnel Showing Air Locks Advocated by Mr. Seymour.

Plan and Elevation Present But One of the Two Tubes. The Ventilating System Proposed Would be Reversed for the Other Tube.

DIFFERENCE BETWEEN FLUSHING AND DILUTION SYSTEMS

"Any novice can easily demonstrate the difference in efficiency between a flushing system and a diluting system by trying the following simple experiment:

"Take a water glass and fill it with clean water add to this five drops of aniline red or blue keep it constantly stirred to correspond with the stirring that will take place in the tunnel every time an automobile passes through.

"Take a teaspoonful of clean water and put it in the mixture, then take a teaspoonful of the mixture out of the glass and put it in a pail.

"Continue this process until the pail is full of water, or until you have 100 glasses of water and you will still find traces of the aniline in the original mixture in the glass.

"Next take the same kind of a mixture, place a funnel in the glass with the stem reaching to the bottom. Pour a glass of water in the funnel and let it overflow the glass, then pour another glass, and by the time you have done this five times you will find less trace of the aniline in the glass than you did by passing 100 glasses of water through the receptable by the teaspoonful method, the method to which the commission is definitely committed.

PREFERS "A FLUSHING SYSTEM"

"Numerous experiments along this line have conclusively proved the flushing process to be at least twenty times as efficient in removing obnoxious gases from a chamber as the cross-dilution process.

"Imagine a truck loaded with inflammable material taking fire in the tunnel—a condition that is sure to occur. Naturally the burning truck must stop. Where it stops it will be consumed, and the cross current of air will accelerate the fire and make it a furnace, impossible for any fire-fighter to get near to it from either end.

"The heat generated by the blast of air on the burning truck will spread both ways from the fire, and if the following car is close up, the fire might spread to the cars lined up behind the burning car. All the cars ahead could run to safety.

FEARS INJURY TO TUNNEL

"The heat generated by such a fire might easily—because of its localized intensity—destroy or injure the tunnel itself. The air blast on the fire could not be stopped, for then all ventilation would stop, and all the cars that could not back out of the tunnel would have to be abandoned.

"If the flushing of the tunnel by means of an air current through the tunnel were used, a truck could burn up and all the cars ahead of it would run out to safety, and all the cars behind it would be safe because the smoke and heated air could not back up against the wind. Fire-fighters could approach the fire from the windward end, and the heat generated could not expand and crack the tube, because it would be distributed throughout the remainder of the tube at a harmless temperature.

"From the standpoint of operating costs, if the proposed ventilating machinery is run to its capacity the expense of operation will come to approximately $800,000 per year, providing the current necessary to operate the air-moving machinery is purchased at a two-cents-per-kilowatt-hour rate.

"If a system of flushing the tunnels had been adopted, the operating cost would have been about one-quarter, and the construction cost less than one-eighth, while the ventilation of the tunnel would have been assured.

"With an air current traveling through the tunnel from thirty to thirty-five miles per hour in the direction of the travel, with the air exhausted from the tunnel by powerful driven fans into the sky several hundred feet from the exit, in large enough volume to produce a back draft at the exit, the tunnel would have been flushed once every four minutes with a volume of air so large that the percentage of gas would be practically nil, about two and one-half parts in 10,000 while all that has ever been claimed for the method that has been practically adopted is four parts in 10,000.

OTHER ADVANTAGES OF FLUSHING

"The advantages of the flushing proposition are:

"First, if all the traffic were stopped for four minutes, the entire aerial contents of the tunnel would be discharged and the tunnel would be scoured as clean as the outdoor atmosphere could make it, while with the cross-ventilation the same results could not be obtained in an hour; in fact, can never be obtained.

"Second, the tunnel would become a pneumatic tube, the air current assisting by pushing the cars down the grade and across the level, necessitating only a small consumption of gasoline and correspondingly small amount of exhaust gas.

"Third, should a fire take place anywhere in the tunnel, all the cars ahead of the fire could run out to safety. The cars behind the fire would remain safely at rest until the fire was put out, and the firemen could approach the burning automobiles safely from the windward side.

APPROVES LINING WITH TILE

"The tunnel should be as smooth inside as tiling can make it, and there should be no blocking of the air passage by flues, partitions, or any other obstruction. In the Hudson & Manhattan Tubes there is a high air pressure (due to the obnormal skin friction of the rough walls) on the front of each train, and a minus at the rear because the trains act as pistons and do the flushing. In a vehicular tunnel the moving cars should be assisted on their way, thereby reducing the amount of dangerous gas exhausted, and to that extent helping to keep the tunnel clean."

On the point of the fire hazard, Chief Engineer Milton H. Freeman shortly before his death declared that both the ventilating system itself and the provisions made for fighting a fire from any cause insure the confining of such a fire to a very narrow area in the tunnel.

EXPERIMENT AS TO FIRE HAZARD

"In the Bureau of Mines experiments, made in an experimental tunnel constructed in an abandoned coal mine near Pittsburgh," said Mr. Singstad, taking up the statement at this point, "we did not create fires, because the tunnel shell we used was of wood. But we did set off smoke bombs. And the effect of the ventilation system was that the area over which the smoke spread, with cars running at normal speed in the tunnel, never exceeded 60 ft. or 30 ft. from the center of the smoke's origin. The same would be true of fire.

"The reason for this is that the transverse ventilation, taking in fresh air at the roadway level and discharging vitiated air, smoke and gases at the ceiling level, every 15 ft., carries all gases and impurities directly upward and out, not along the line of the tunnel."

"But your draft from below constitutes, does it not," he was asked, "something akin to a draft in a blacksmith's forge, blowing your fire hotter and brighter?"

"Precisely," was the answer. "And that is an advantage. The fuel of that fire will be the more quickly consumed, the zone of the fire the more narrowly confined, the fire the sooner over."

"Moreover," rejoined Mr. Freeman, "cars ahead of the fire will keep on moving and quickly be out of danger. As to those behind, we must not assume that cars are going to be so packed in the tunnel that the car behind one taking fire would be so close as to be immediately endangered. This is a two-path tunnel, in each tube. Cars will have opportunity to back away from danger.

"There will be a complete signal system and trained men to work it. When a fire or any stoppage occurs anywhere in the bore a policeman's finger pressed on a button will set stop signals all the way out to the approaches. No more cars will enter until the signal is changed. If one line is blocked another will keep moving and space will quickly be provided for blocked cars to move over or back at need."

Further, it was explained that there will be an attached line of hose ready for use every 120 feet in the tunnel and every 140 feet a battery of fire extinguishers of the "foaming" type. These have been demonstrated, according to the tunnel engineers, to be capable of extinguishing the hottest kind

of oil or gasolene fire quickly, by reason of the fact that the "foam" thrown on the fire shuts off the oxygen it requires to continue burning, and so smothers it out.

NO DANGER TO STRUCTURE

"But," pursued the questioner, "assuming a burning car, with the flames blown high and hot by the underdraft from the ventilators, what would be the effect on the tunnel itself? Would the cast-iron lining warp or crack or buckle?"

"Not at all," replied Mr. Singstad. "In fireproofing practice it is accepted that two inches of concrete forms a perfect fire stop, even over vital parts of the structure.

"At the top of the roadway in the tunnel you have an air chamber, the exhaust draft flue. This is inclosed by two inches of reinforced concrete, itself a fireproofing material. Below that you have another two inches of mortar and tile, lining the tunnel. Four inches at the top, in other words, of fireproofing, and beyond that an air chamber. No fire would affect the tunnel lining itself through that."

When Is a Return-Line System Efficient?

To refute an apparently common opinion that high efficiency in a two-pipe heating system is indicated by a return pipe temperature low enough to be cool to the touch, is the purpose of a folder on "Return Line Temperatures" issued by the C. A. Dunham Company of Chicago.

Many an installation is held to be working "just right" if, with the supply pipes too hot to touch, the return pipe is cool enough to permit safe contact by the hand. That a system may be operating at extremely high efficiency with the return actually carrying steam (which has not been passed by the trap, but is the result of re-evaporation) is the contention of the Dunham research laboratory, and the dependence of radiator efficiency on the proper functioning of the trap is shown in the circular.

Put in another way, the efficiency of the radiator may approach 100%, and the efficiency of the system, as a whole may be low, due to the passage of steam by, and consequent low efficiency of the traps. On the other hand, if the trap efficiency approaches 100%, the efficiency of the radiator units, and of the system as a whole, must also approach 100%.

That the temperature of the return is not independent of the pressure in the supply, but bears a definite relation thereto, is also deduced from the data submitted.

The circular contains five illustrations of curves taken from tests of as many traps, both at atmospheric pressure in the returns and with a vacuum of 10 in. of mercury; in both series the supply pressure was varied from 0 to 10 lbs. per square inch, gauge.

The circular states that:

Heat follows laws which are just as invariable as the laws of gravitation. Consideration of these laws in connection with what occurs in a heating system will show it is impossible for the return line temperature to continue cool to the touch after the system has been in operation a while, or to be independent of the pressure obtaining in the return line.

Repeated experiments have shown that when the pressure to which any liquid is subjected increases, more heat can be put into it and that when more heat is put into a liquid or its vapor confined in a closed space, the pressure exerted by it increases. Thus, if we take water in a boiler and start to heat it the temperature of the water steadily rises until it reaches the boiling point at the pressure then existing in the boiler. Upon continued heating the temperature of the water remains constant and the formation of steam or vaporization of the water begins. If the steam is condensed as rapidly as it forms there will be no further increase in the rate of vaporization and the pressure will remain constant.

If, however, the rate at which heat is applied to the water is greater than that at which it is abstracted from the steam, so that the vaporization of the water goes forward more rapidly than its condensation, the steam pressure will increase and this increase in pressure will be accompanied by an increase in the temperature of the steam and the water within the boiler. This will hold true in any kind of steam heating system or in a water heating system where the water is heated rapidly enough to cause boiling.

If a thermometer was applied to the inlet of a radiator so as to measure the temperature of the steam, the temperatures thus observed if plotted against the steam pressure would give a curve such as the one marked "Inlet" in Fig. 1.

The accompanying curves show the results secured by tests on the Dunham radiator trap under steam pressures from 0 to 10 lbs. per square inch gauge.

If the boiler is to be safeguarded from injury it must carry sufficient water to always maintain the normal boiler water-line. In keeping with this the condensate must be returned to the boiler as rapidly as it forms, which obviously is possible only when no water is accumulated in the radiators.

With the water being released from the radiators as rapidly as it forms by

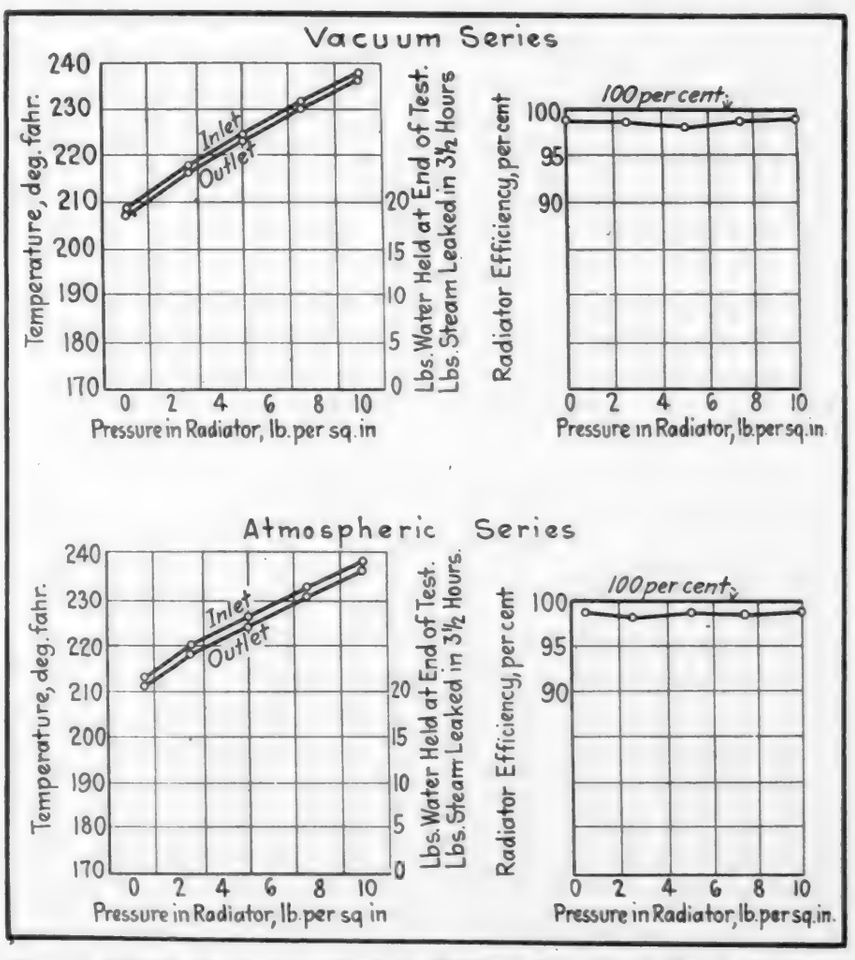


Fig. 1. Results of Tests on Dunham Radiator Trap Under Steam Pressures From 0 to 10 lbs. Gauge.

condensation of the steam, the temperature of the condensate will bear a constant relationship to the temperature of the steam but will be slightly below steam temperature because of some heat abstraction from the water. Since the temperature of steam increases with an increase in the pressure, the temperature of the condensate entering the returns must also increase with pressure, and the temperature of the condensate leaving the trap will increase with the pressure as is shown by the curve labeled "outlet temperature."

The reduction of the outlet temperature of the radiator to any considerable extent below the steam temperature is caused and always accompanied by the accumulation of water in the radiator.

It should be further noticed that if the surface efficiency of the radiator is to be maximum it is necessary for the outlet temperature to closely approach the steam temperature at every pressure. In the illustration the surface efficiency of the radiator is approximately 99% at every steam pressure.

Since water carries more heat at higher temperatures it is evident from the foregoing that each pound of condensate carries into the return piping more heat at the higher pressures than at the lower pressures. The return piping receives its heat from the condensate which enters it from the radiators and steam main drips and consequently its temperature is always proportional to the temperature of the condensate. The ability of the return piping to dissipate or give off the excess heat does not increase in direct ratio to the increased quantity of heat brought into the returns, and consequently the temperature of the return line must increase with an increase in the steam pressure and such an increase is no indication of the traps leaking steam.

Consider that a radiator is working at 0 lbs. pressure where the steam temperature is substantially 212°. In such a case the water would leave the radiator at a temperature of 207° to 209°, and its tendency would be to warm the return-line to this temperature. Evidently this would not be possible because a part of the heat in the water would be used to raise the iron of the pipe from the initial temperature to the one prevailing when a constant temperature is reached and the remainder to compensate for the heat lost from the pipe.

Just what particular temperature would be attained would vary with each individual job. Ordinarily, however, the temperature would be well above 165°, which is too high to permit its being cool to the touch. No steam would be present because at atmospheric pressure steam does not form until a temperature of 212° is reached, although there would be a certain amount of vapor given off by the water because water may be vaporized under such a condition.

Applications of the Warm-Air Heater Rating Formula

By V. S. Day

THE rating formula for warm-air heaters, developed at the University of Illinois and published in THE HEATING AND VENTILATING MAGAZINE for February, by Professor A. C. Willard, has prompted a number of inquiries as to the application. The following discussion is intended to show the application to a few actual heaters on which measurements have been made.

For the benefit of those who may not have available a copy of the formula it is repeated and the various factors defined.

$$\text{Square inches of leader pipe supplied} = \frac{(0.75 \times C \times G \times F \times E)}{136} \times \frac{}{[1 + 0.02\ (R - 20)]}$$

in which:—

- 0.75 = an average value for the fraction of the heat available at the furnace which is delivered actually at the registers.
- G = grate area, square feet.
- C = combustion rate, pounds coal burned per square foot of grate per hour. This depends on register temperature desired, and for a register temperature of 175° F. is 7.5.
- F = calorific value of fuel as fired, B.T.U. per pound.
- E = efficiency of heater, or heat available at bonnet divided by heat available in fuel, which at 175° at the register is approximately 0.55.
- R = ratio of heating surface area (exclusive of ashpit) to grate area.
- 0.02 = the amount of increase or decrease in rating for each unit in the value of R above or below 20 (as the case may be).
- 136 = B.T.U. carrying value of one square inch of pipe in an average installation assuming half of the heat is delivered to first and half to second-story rooms. This corresponds to a register temperature of 175°. (See Fig. 71 Bulletin No. 141 Engineering Experiment Station University of Illinois.)

At first sight this formula appears very complicated but if the values for F and E which were found in the tests at the University are substituted the formula becomes much simplified, thus

$$\text{Square inch leader supplied} = \frac{0.75 \times 7.5 \times G \times 12790 \times 0.55}{136} \times \frac{}{[1 + 0.02\ (R - 20)]}$$

or square inch leader pipe supplied

$$= 292\ G\ [1 + 0.02\ (R - 20)]$$

This formula is much *simpler in form but is good only if the suggested substitutions are accepted.* If fuel values other than 12790 are used it must be modified in proportion. Likewise, if a temperature very different than 175° at the register is to be assumed as a basis correct values must be obtained from Bulletin No. 141 and substituted in place of 7.5, 0.55, and 136.

With the formula before the mind of the reader its application to a well-known line of cast-iron circular or "horseshoe" radiator furnaces may be observed in Table 1.

By reading down any column the successive steps in the calculation of the rating for any one size furnace of this particular series may be observed. The manufacturer of this particular line of heaters has rated his goods conservatively as his catalog shows ratings, for all sizes, lower than those arrived at by the calculation shown in Table I.

In the foregoing examples the furnaces, excepting one, were rated down on account of low heating surface to grate surface ratios. Consider the cases of two other furnaces on the market which have higher values of R and ob-

TABLE I. AREAS AND RATINGS OF SERIES OF CAST-IRON CIRCULAR RADIATOR FURNACES.

Nominal firepot size		22	24	26	28	30
Grate dia., actual, in.		18	20	22	24	26
Grate area, Sq. ft. = G		1.76	2.18	2.64	3.14	3.68
Heating surface areas, Sq. ft.	Radiator, Dome	20.8	24.3	29.4	31.3	41.2
	Feed Section	10.3	12.1	13.2	13.9	14.6
	Firepot	5.4	5.9	6.9	7.5	9.7
	Extras	1.0	1.0	1.0	1.0	1.0
	Total	37.5	43.3	50.5	53.8	66.5
Heating surface divided by grate area = R		21.3	19.9	19.1	17.1	18.1
Value of 292 G		514	636	770	917	1073
Value of R — 20		1.3	−0.1	−0.9	−2.9	−1.9
Value of 1 + 0.02 (R — 20)		1.026	0.998	0.982	0.942	0.962
Rating = 292 G [1 + 0.02 (R — 20)] Square inches of leader pipe to be supplied		527	635	755	864	1030

serve the effect of R on the ratings of the furnaces.

TABLE II. AREAS AND RATINGS OF FURNACES HAVING RELATIVELY LARGE HEATING SURFACES

Nominal firepot size		24	27
Grate dia., actual, in.		22.5	22
Grate area, Sq. Ft. = G		2.76	2.64
Heating Surfaces	Radiator	33.0	54.2
	Dome	10.7	
	Feed Section	10.0	36.9
	Firepot	7.3	
	Extras	3.4	3.6
	Total	64.4	94.7
Heating surface divided by grate area = R		23.3	35.8
Value of 292 G		806	770
Value of $R - 20$		3.3	15.8
Value of $1 + 0.02\ (R - 20)$		1.066	1.316
Rating 292 G $[1 + 0.02\ (R - 20)]$ = Square inches of leader pipe to be supplied		860	1010

From the two tables it may be observed that furnaces having high ratios of heating surface to grate surface are rated proportionally higher whereas those having ratios below 20 are reduced.

It should be observed that no heater tested in the Research Laboratory had a value of R greater than 30 and the rating shown for the heater in the second column of Table II may be outside the limitations of the formula, although the general principle is correct.

The application of the rating formula may be seen to be a matter of accurate measurement of areas and simple arithmetic computation. However, it would not be amiss to call attention once more to the limitations of the formula as regards heat value of the fuel, combustion rate and corresponding register temperature and also the corresponding value for the B.T.U. delivering capacity of one square inch of leader pipe. Unless these factors are intelligently used the ratings will not be reliable. It would be advisable, therefore, for the engineer to review the original article on the rating formula in the February issue of this magazine.

Standardization of Valves Postponed

AMERICAN ENGINEERING STANDARDS COMMITTEE announces that it has decided to postpone indefinitely the conference on the standardization of valves, which has been under discussion during the past two years. The postponement is taken as the result of a request to this effect by the Manufacturers Standardization Society of the Valves and Fittings Industry.

The action in postponing the conference is in accordance with the announced policy of the American Engineering Standards Committee that it will not act as an initiating body, and that it undertakes work on a project only upon a formal request by a responsible body and then only after the committee has assured itself that it is the concensus of industry that it is desirable that the work should go forward. Hence it was evident that the work of standardization could not be prosecuted successfully under A. E. S. C. procedure so long as the Manufacturers Standardization Society of the Vales and Fittings Industry is unwilling to enter a conference of all interested groups to discuss the advisability of undertaking the work and, in the case of affirmative decision, to decide along what lines the work should proceed.

The Proposed Revision of Ventilation Standards in Ohio

Amid much seething, bubbling and sputtering, the Ohio State Legislature, the Ohio Board of Building Standards, and various interests in the heating and allied industries have been engaged during the past few weeks in a lively tilt to determine how little air circulation or how much should be required by law for public buildings in the sovereign State of Ohio.

It appears that great confusion of thought obtains, and probably the most confused of all are the legislators who have had thrust upon them a highly technical problem and who are being pulled this way and that by the reasoning of scientists, engineers, salesmen and specialists whose words they do not comprehend.

There seems to be good ground for the statement that a great deal of ventilating apparatus has been sold for use in schools and other public buildings in Ohio, as well as in other states, that, for various reasons is practically inoperative. It has been stated that Ohio is now spending at the rate of about twenty million dollars annually for new school buildings alone, in which the saving that might be effected through the elimination of all ventilating equipment from the program would be material. Coupled with this initial saving would be a large annual saving equal to the cost of operation and maintenance.

Possibly these thoughts were back of the proposal to cut the minimum air requirements to 10 cu. ft. per person per minute.

To aid and abet the legislators comes the report from Cleveland that health curves for a period of ten years show no difference between pupils in schools with the most elaborate equipment (possibly it has not been in operation) and those in schools that have no mechanical ventilation at all.

Taken all in all, the solons of Ohio have bitten into a rather complicated little sandwich, and it is possible that, before they have acquired ability to comprehend the problem of public building ventilating, they may suffer nightmares that usually follow attempts to swallow matters beyond the comprehension of the average lawmaker.

Annual Meeting of British Institution of Heating and Ventilating Engineers

Smoke abatement formed the principal topic in the address of Alcwyn A. Jones, the incoming president of the Institution of Heating and Ventilating Engineers at the annual general meeting in London, in February. The smoke problem in England has a phase almost unknown in the United States on account of the universality of heating with coal burned in open fireplaces.

Mr. Jones stated that it was estimated that 2½ million tons of soot were deposited annually in England, the average efficiency of heating and cooking throughout the country being estimated at only 25%. There is no little agitation in the press on the subject, and it was the opinion of the president that the institution had not taken up the matter with sufficient energy. He stated that it appeared to him more a matter of the proper education of the people than one of legislation, and urged the members to join in a campaign of education along this line.

"Unknown Factors in Heating and Ventilating" was the subject of a paper by A. H. Barker, and while the subject matter appears to savor to a degree of the theoretical and scientific, the message points straight towards the root of present difficulties in the profession —lack of fundamental knowledge.

Gilbert & Barker Oil Burner Listed by Underwriters

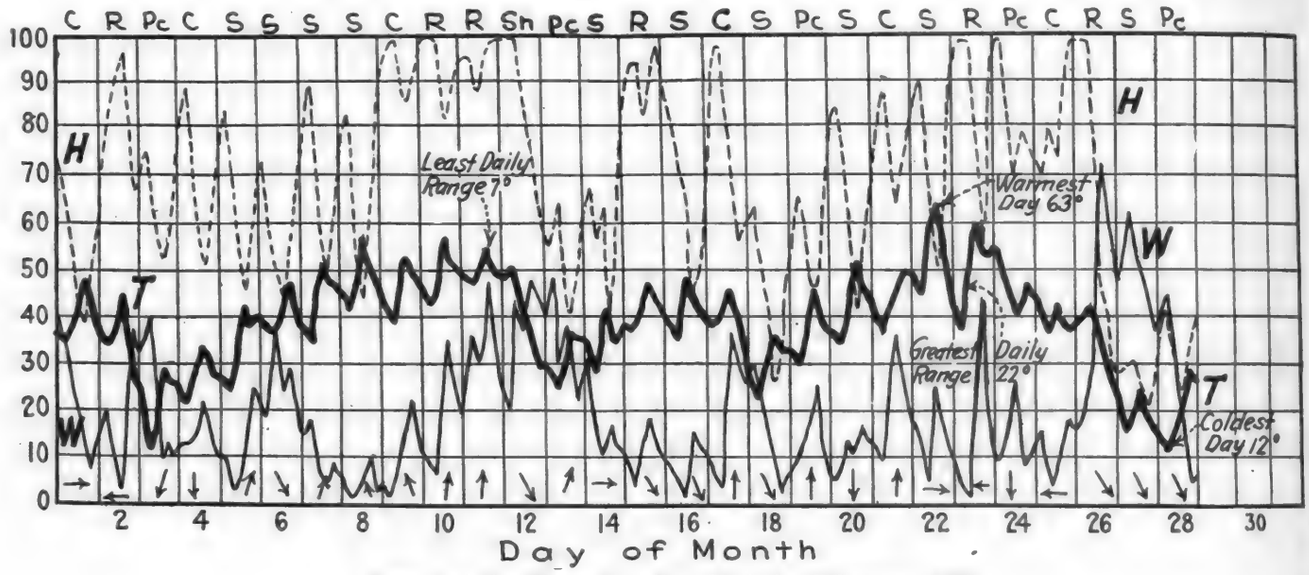
Under date of March 19, the Underwriters Laboratories, Chicago, release the listing of the following:

Gilbert & Barker "Type HB2" domestic oil burner. Gilbert & Barker Mfg. Co., manufacturers, Cold Spring Ave., Springfield, Mass. Mechanical-draft oil burner with a. c. or d. c. motor drive; temperature control—automatic; ignition—gas pilot; fuel—distillate or gas oil not heavier than 30° Baumé; fuel feed—suction from float chamber to combustion chamber and gravity to float chamber; designed for hot water, steam and hot-air installations; marking: "Type HB2" on etched name-plate attached to guard for drive shaft.

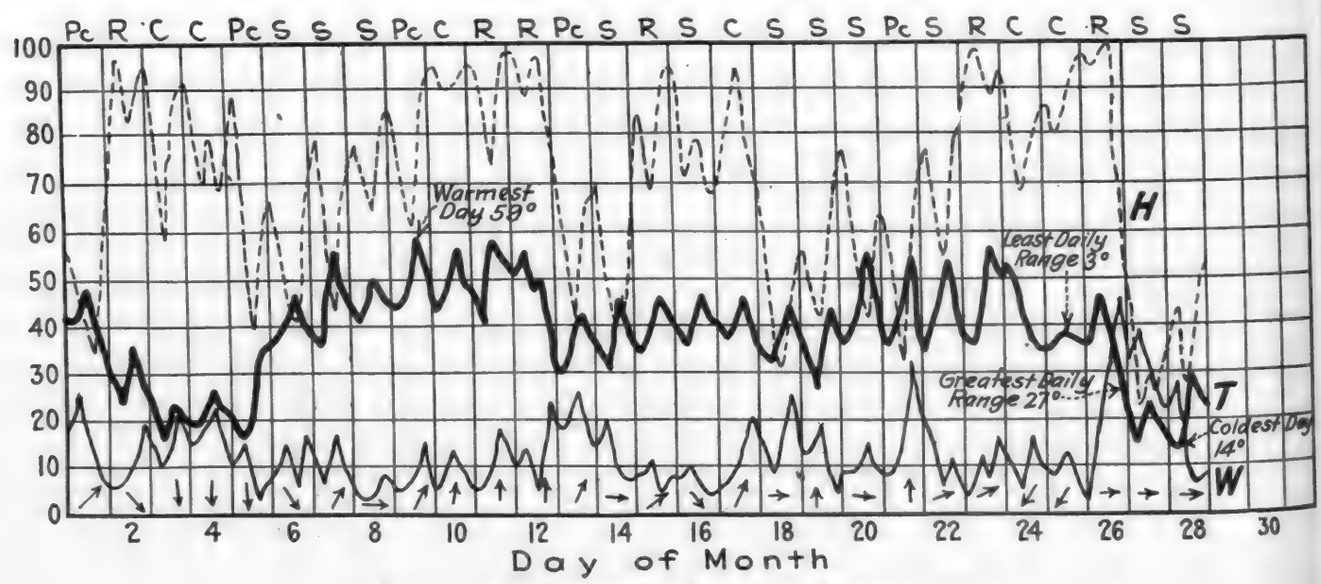
Standard when fuel storage capacity conforms to local requirements and installation is made in accordance with requirements of inspection department having jurisdiction.

The Weather For February, 1925

	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, deg. F.	63	59	58	62	69
Date of highest temperature	22	9	8	8	6
Lowest temperature, deg. F.	12	14	9	1	12
Date of lowest temperature	28	28	28	27	27
Greatest daily range, deg. F.	22	27	29	26	27
Date of greatest daily range	23	26	2	25	20
Least daily range, deg. F.	7	3	4	4	4
Date of least daily range	11	25	1	15	2
Mean temp. for month, deg. F.	38.5	38.0	39.2	32.2	40.8
Normal mean temp. for month, deg. F.	31.3	28.1	32.3	27.4	34.8
Total precipitation, in.	1.92	1.55	1.91	1.62	2.19
Total snowfall, in.	0.6	Trace	2.7	4.7	3.4
Normal precipitation, this month, in.	3.87	3.44	2.66	2.16	2.75
Total wind movement for month, miles	11488	6919	6770	8061	9493
Average wind velocity, miles per hour	17.1	10.3	10.1	12.0	14.1
Prevailing direction of wind	N. W.	W.	W.	S.	S.
Number of clear days	9	12	3	6	9
Number of partly cloudy days	7	4	12	7	8
Number of cloudy days	12	12	13	15	11
Number of days with precipitation	8	6	12	8	6
Number of days with snow	1	0	2	4	2
Snow on ground at end of month, in.	None	None	Trace	None	0.9


C R Pc C S S S S C R R Sn Pc S R S C S Pc S C S R Pc C R S Pc
H
T
W
Least Daily Range 7°
Warmest Day 63°
Greatest Daily Range 22°
Coldest Day 12°
Day of Month

Record of the Weather in New York for February, 1925
(Hourly Observations of the Relative Humidity Plotted on This Chart)


Pc R C C Pc S S S Pc C R R Pc S R S C S S S Pc S R C C R S S
H
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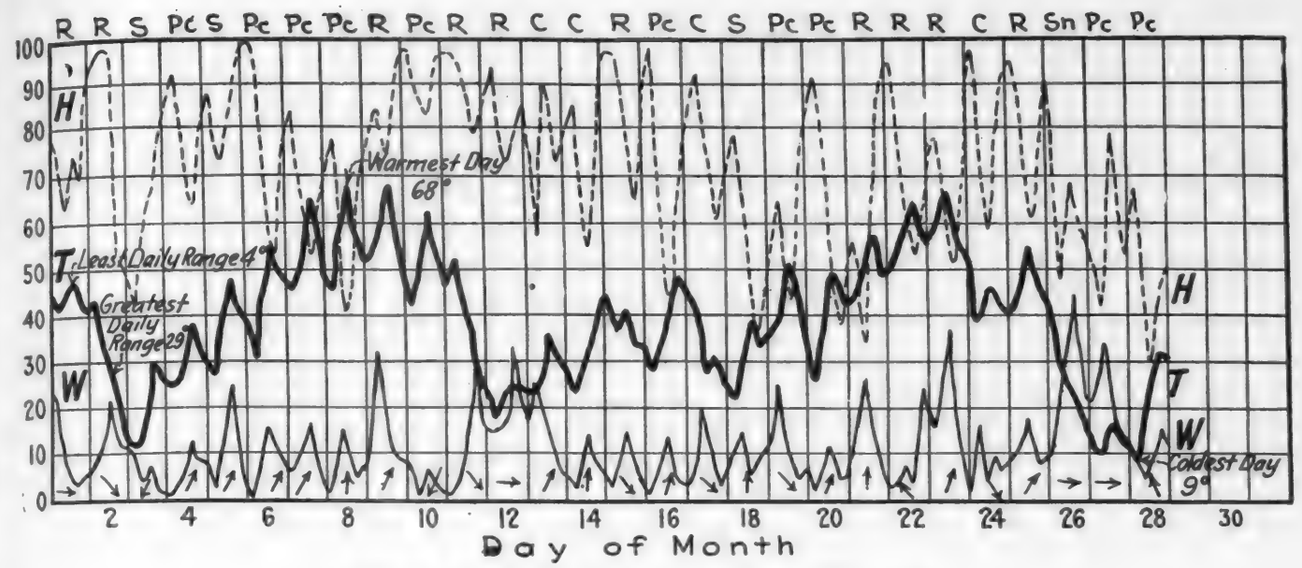
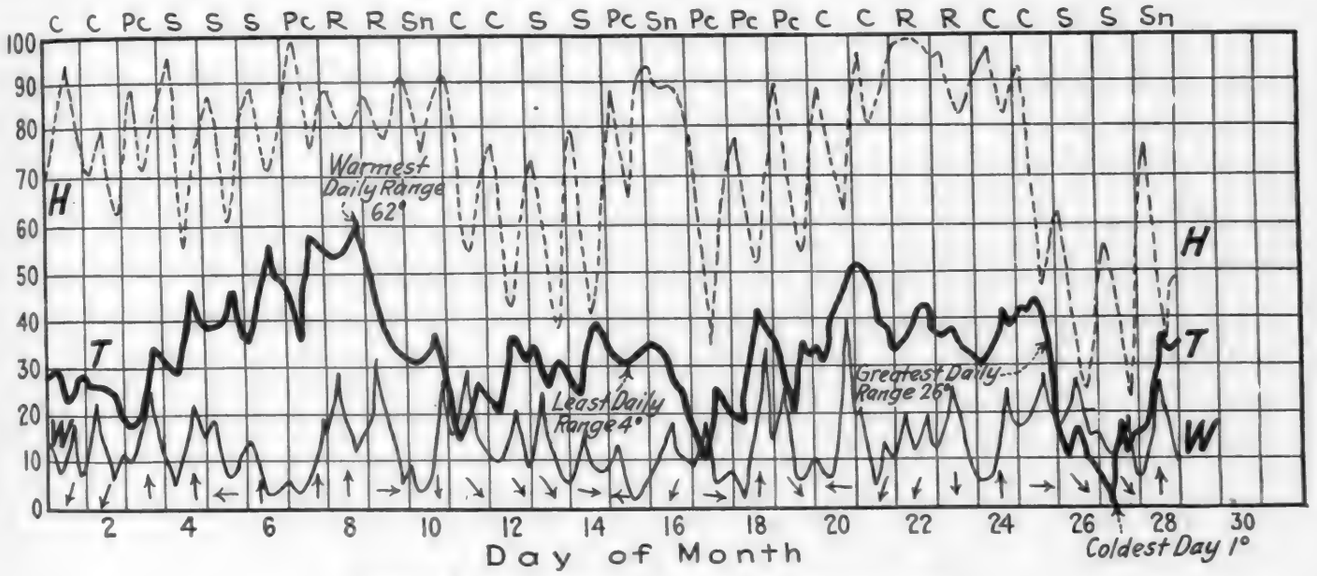
Warmest Day 59°
Least Daily Range 3°
Greatest Daily Range 27°
Coldest Day 14°
Day of Month

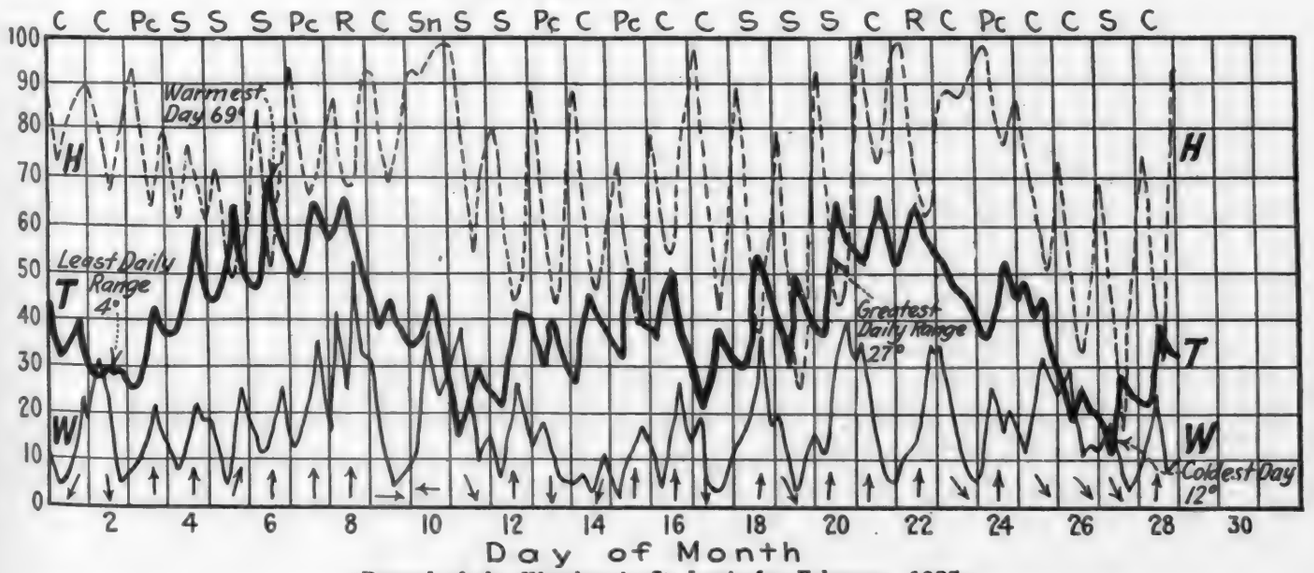
Record of the Weather in Boston for February, 1925


R R S Pc S Pc Pc Pc R Pc R R C C R Pc C S Pc Pc R R R C R Sn Pc Pc
H
T
W
Warmest Day 68°
Least Daily Range 4°
Greatest Daily Range 29°
Coldest Day 9°
Day of Month

Record of the Weather in Pittsburgh for February, 1925


C C Pc S S S Pc R R Sn C C S S Pc Sn Pc Pc Pc C C R R C C S S Sn
H
T
W
Warmest Daily Range 62°
Least Daily Range 4°
Greatest Daily Range 26°
Coldest Day 1°
Day of Month

Record of the Weather in Chicago for February, 1925


C C Pc S S S Pc R C Sn S S Pc C Pc C C S S S C R C Pc C C S C
H
T
W
Warmest Day 69°
Least Daily Range 4°
Greatest Daily Range 27°
Coldest Day 12°
Day of Month

Record of the Weather in St. Louis for February, 1925

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau. Heavy lines indicate temperature in degrees F. Light Lines indicate wind in miles per hour. Broken lines indicate humidity in percentage from readings at 8 A. M., 12 M., and 8 P. M. S—Clear, PC—partly cloudy, C—Cloudy, R—rain, Sn—snow. Arrows fly with prevailing directions of wind.

Fuel Oil in New York Office and Mercantile Buildings

A TIMELY discussion of oil-burning developments in New York office and mercantile buildings featured a joint meeting of the metropolitan section of the A.S.M.E. and the New York Chapter of the A.S.H. & V.E. at the Engineering Societies Building, March 3. The subject was presented at length in a paper by Andrew W. Coyle. Following are the principal portions of Mr. Coyle's address:

"The authorities no longer regard fuel-oil as a dangerous explosive. The question is not whether we can get approvals but whether we can get oil at a price which will make future oil burning economical.

"Experiments in the use of oil as fuel under steam boilers, began in this country about forty years ago. The oil used in these experiments was of a grade which could be sprayed without heating. Spraying was effected by steam or compressed air. The spray was usually projected against a plate to cause complete combustion. Later the oil was sprayed over checker plates. These devices were necessary because the early sprays were not effective and did not spread the flame so as to bring about the proper mixture of air. Checker plates are still in use to some extent but are rapidly being superseded by burners which produce conical sprays.

STORAGE PROBLEM THE BIG FACTOR IN NEW YORK

"Before fuel-oil began to be used in the commercial buildings of New York City, it had come into extensive use elsewhere. The problems attending its introduction here were therefore not problems of burning but of storage. Prior to 1919, oil had been burned in the city limits in a number of industrial plants, for annealing and similar purposes, but up to that time the authorities had established no code of rules governing the storage and burning of fuel-oil. The storage of oil in or near buildings had been steadily and conscientiously disapproved by the Fire Underwriters, the Bureau of Fire Prevention and the Fire Department.

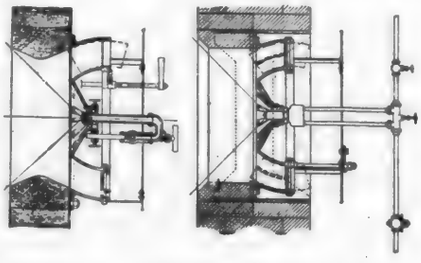
"When, therefore, in 1919 there developed an insistent demand for the right to install oil-burning systems in this city, it became necessary to establish rules to govern these installations. Everybody interested got busy, that is almost everybody. There were a few who just stood pat and shook their heads. Then followed a lot of what the late Mr. Dinkelspiel would call 'discussionationing.' Sometimes it appeared that where two or three were gathered together, there were three or four different opinions.

THE SINGER BUILDING PLANT

"The discussion focused about the plant being installed in the Singer Building. The basement of this building became a sort of forum where everybody came to criticize and offer suggestions, some helpful, others obstructive. We have to take off our hats to the men who installed this plant for the patience and tact with which they carried out a difficult undertaking. In the end they succeeded in satisfying everybody, even the most skeptical. The plant has now been in operation under official license for more than five years. The cost data on the operation of this plant have been arranged with great care and are the most reliable and complete I have found.

"During the period of discussion to which I have referred, there were a good many engineers who expressed irritation at bureaucratic requirements. I believe that phase of the situation was happily passed. Looking back over the road travelled, we are bound to acknowledge that the obstacles encountered were no greater than those usual to an undertaking about which a great many people have to be consulted.

"When illuminating gas was first used, violent opposition was encountered. The London Town Council passed a resolution providing that gas pipes must be suspended 1 ft. below ceilings and 4 in. from walls, and prohibiting the use of gas in any bedchamber or place which might be used as such. In spite of our familiarity with its use, gas is one of the most prolific causes of fire to-day. We trust the lighting of a gas burner in a non-fireproof building to a ten-year-old child, but here is general fear of fuel-oil in the best fireproof building that can be constructed. Five years ago people commonly regarded fuel-oil as a malignant demon, ready at all times to break from confinement and, having escaped, to burst into flame. There are still changes desirable in the fuel-oil regulations, I shall call attention to these later.

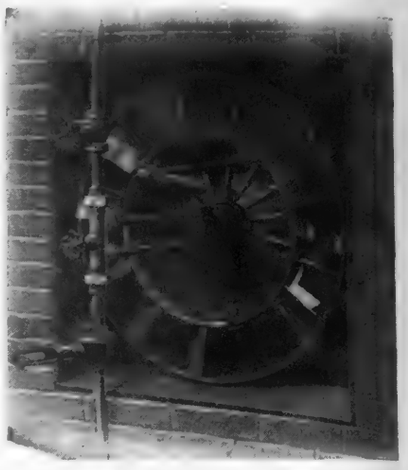


Mechanical Atomizer and Air Register for Burning Fuel Oil.

"The records of the Bureau of Fire Prevention show that they have inspected and passed upon between 300 and 400 oil-burning installations. The bulk of these are small equipments, using one or two burners. The small installations, of course use light oils which do not require preheating.

THE A.S.H. & V.E. BOILER RATING

"Several years ago the American Society of Heating and Ventilating Engineers put forward a formula under the title 'rating.' The rating as determined by this test shall be calculated by the following formula:



Typical Oil Burner with Mechanical Atomizer Installed in Furnace Wall With Radiation Plate Removed.

$$\frac{C \times H}{T} = \text{boiler capacity per hour in B.T.U.}$$

C = number of pounds of dry fuel consumed (18).

T = Duration of firing period.

H = Total B.T.U. available at the boiler outlet per pound of dry fuel as shown by test, or (18) × (19) × (48).

Note.—The length of firing period will depend upon the size of boiler, kind of fuel and purpose of test.

"In effect this formula merely establishes the size of the fire-box; it has nothing to do with the efficiency or capacity of the boiler.

HOW BOILER MANUFACTURERS ARE TAKING ADVANTAGE OF FORMULA

"Many manufacturers of small cast-iron boilers are taking advantage of this formula and are turning out boilers which are chiefly fire box and smoke flue. They give the impression that these boilers have the American society's stamp of approval. The construction results in very high stack temperature. Introduction of oil aggravates this situation very much because small burners of the type, I have shown, do not touch the sides of the fire-box and therefore they have very little heating surface above the fire-box which has to do all the steaming.

"I think it is a great mistake to allow the installation of oil-burners in boilers of this character. If we are going to use oil-burners, we should have boilers

RADIATION COMPUTING—THE REYNOLDS TABLES

Comparative Costs and Heat Emission for 22-in. and 23-in. Radiators

Steam Temp. 215° F. Room Temp. 70° F.

No. of Sections	Length	1 Col.						2 Col.						3 Col.						4 Col.					2 Col. Hospital				
		Total B.T.U. Per Hr.	Rated Surface Sq. Ft.	E.D.R.–Sq. Ft.	B.T.U. Per Sq. Ft.	R.C. Steam	R.C. Water	Total B.T.U. Per Hr.	Rated Surface Sq. Ft.	E.D.R.–Sq. Ft.	B.T.U. Per Sq. Ft.	R.C. Steam	R.C. Water	Total B.T.U. Per Hr.	Rated Surface Sq. Ft.	E.D.R.–Sq. Ft.	B.T.U. Per Sq. Ft.	R.C. Steam	R.C. Water	Length	Total B.T.U. Per Hr.	Rated Surface Sq. Ft.	E.D.R.–Sq. Ft.	B.T.U. Per Sq. Ft.	R.C. Steam or Water	Total B.T.U. Per Hr.	Rated Surface Sq. Ft.	E.D.R.–Sq. Ft.	B.T.U. Per Sq. Ft.	R.C. Steam or Water
1	2.5	654	1.67	2.71	392	.79	.82	967	2.33	4.00	414	.72	.74	1138	3	4.71	379	.78	.81	3	1430	4	5.92	358	.85	998	2.33	4.13	428	.76
2	5.0	1112	3.33	4.60	334	.93	.96	1520	4.67	6.29	326	.92	.94	1816	6	7.51	303	.97	1.00	6	2320	8	9.60	290	1.04	1606	4.67	6.66	344	.95
3	7.5	1585	5.00	6.43	311	1.00	1.03	2093	7.00	8.66	299	1.00	1.03	2496	9	10.33	277	1.06	1.09	9	3211	12	13.29	268	1.13	2213	7.00	9.16	316	1.03
4	10.0	1997	6.67	8.26	300	1.06	1.07	2666	9.33	11.03	286	1.05	1.07	3174	12	13.13	265	1.11	1.14	12	4101	16	16.97	256	1.18	2821	9.33	11.67	302	1.08
5	12.5	2440	8.33	10.10	293	1.06	1.09	3239	11.67	13.40	278	1.07	1.10	3854	15	15.95	257	1.14	1.18	15	4992	20	20.65	250	1.21	3429	11.67	14.19	294	1.11
6	15.0	2882	10.00	11.92	288	1.08	1.11	3809	14.00	15.76	272	1.10	1.13	4532	18	18.75	252	1.17	1.20	18	5882	24	24.34	245	1.24	4036	14.00	16.70	288	1.13
7	17.5	3324	11.67	13.75	285	1.09	1.12	4376	16.33	18.10	268	1.12	1.15	5211	21	21.56	248	1.18	1.22	21	6773	28	28.02	242	1.25	4644	16.33	19.21	284	1.15
8	20.0	3767	13.33	15.59	283	1.10	1.13	4943	18.67	20.45	265	1.13	1.16	5890	24	24.39	245	1.20	1.23	24	7664	32	31.71	240	1.26	5251	18.67	21.73	281	1.16
9	22.5	4209	15.00	17.41	281	1.11	1.14	5510	21.00	22.80	262	1.14	1.17	6569	27	27.18	243	1.21	1.24	27	8554	36	35.39	238	1.27	5859	21.00	24.24	270	1.17
10	25.0	4652	16.67	19.25	279	1.11	1.15	6081	23.33	25.16	261	1.15	1.18	7248	30	29.95	242	1.21	1.25	30	9446	40	39.07	236	1.28	6468	23.33	26.76	277	1.18
11	27.5	5095	18.33	21.08	278	1.12	1.15	6648	25.67	27.51	259	1.15	1.19	7927	33	32.80	240	1.22	1.26	33	10336	44	42.76	235	1.29	7074	25.67	29.27	276	1.18
12	30.0	5538	20.00	22.91	277	1.12	1.16	7213	28.00	29.84	258	1.16	1.19	8606	36	35.61	239	1.23	1.27	36	11227	48	46.45	234	1.29	7683	28.00	31.79	274	1.19
13	32.5	5980	21.67	24.74	276	1.13	1.16	7780	30.33	32.12	256	1.17	1.20	9286	39	38.42	238	1.23	1.27	39	12118	52	50.14	233	1.30	8290	30.33	34.30	273	1.19
14	35.0	6422	23.33	26.57	275	1.13	1.16	8346	32.67	34.53	256	1.17	1.20	9962	42	41.22	237	1.26	1.28	42	13009	56	53.82	232	1.30	8899	32.67	36.82	272	1.20
15	37.5	6865	25.00	28.40	275	1.13	1.17	8897	35.00	36.81	254	1.18	1.21	10643	45	44.03	237	1.26	1.28	45	13896	60	57.49	232	1.31	9506	35.00	39.33	272	1.20
16	40.0	7309	26.67	30.24	274	1.13	1.17	9464	37.33	39.16	254	1.18	1.21	11323	48	46.85	236	1.26	1.28	48	14784	64	61.17	231	1.31	10114	37.33	41.85	271	1.20
17	42.5	7752	28.33	32.07	274	1.14	1.17	10032	39.67	41.51	253	1.18	1.21	12000	51	49.65	235	1.25	1.29	51	15675	68	64.85	231	1.31	10722	39.67	44.36	270	1.21
18	45.0	8193	30.00	33.90	273	1.14	1.17	10601	42.00	43.86	252	1.18	1.21	12679	54	52.46	235	1.25	1.29	54	16567	72	68.56	230	1.32	11927	42.00	46.86	270	1.21
19	47.5	8635	31.67	35.72	273	1.14	1.17	11167	44.33	46.00	252	1.19	1.22	13361	57	55.28	234	1.25	1.29	57	17459	76	72.23	230	1.32	11935	44.33	48.38	269	1.21
20	50.0	9080	33.33	37.57	272	1.14	1.17	11736	46.67	48.56	252	1.19	1.22	14044	60	58.09	234	1.25	1.29	60	18352	80	75.93	229	1.32	12544	46.67	51.90	269	1.21
		5½" Wide x 23" High				1.36	1.40	8½" Wide x 23" High				1.31	1.34	10" Wide x 22" High				1.29	1.33		11¼" Wide x 22" High				1.33	8½" Wide x 23" High				1.43

Radiation Computing—22-in. and 23-in. Radiators. No. 13-WW

For 22-In. and 23-In. Radiators

RADIATION COMPUTING—THE REYNOLDS TABLES

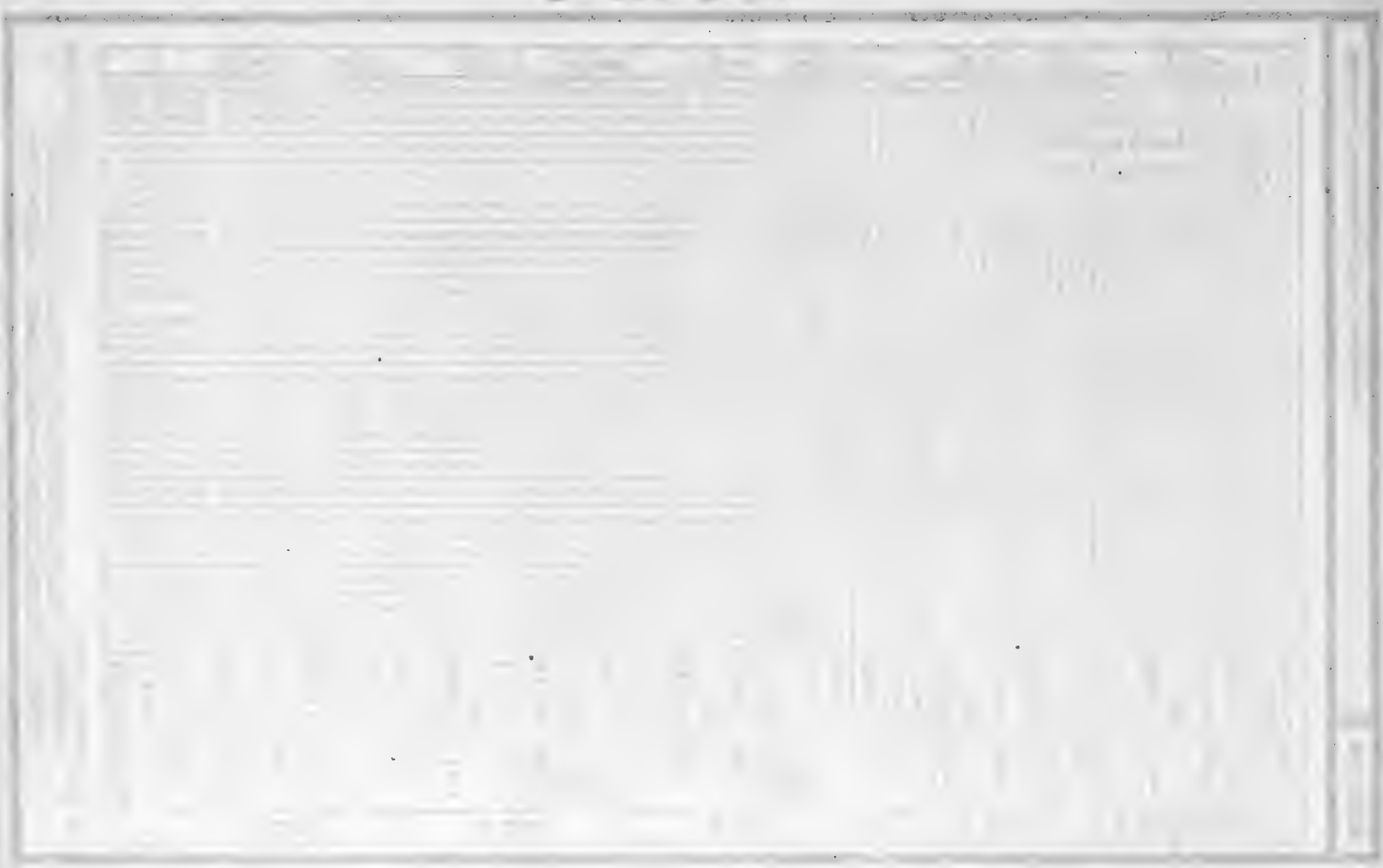
Comparative Costs and Heat Emission for 26-in. Radiators

Steam Temp. 215° F. Room Temp. 70° F.

No. of Sections	Length	1 Col.						2 Col.						3 Col.						4 Col.					2 Col. Hospital				
		Total B.T.U. Per Hr.	Rated Surface Sq. Ft.	E.D.R.–Sq. Ft.	B.T.U. Per Sq. Ft.	R.C. Steam	R.C. Water	Total B.T.U. Per Hr.	Rated Surface Sq. Ft.	E.D.R.–Sq. Ft.	B.T.U. Per Sq. Ft.	R.C. Steam	R.C. Water	Total B.T.U. Per Hr.	Rated Surface Sq. Ft.	E.D.R.–Sq. Ft.	B.T.U. Per Sq. Ft.	R.C. Steam	R.C. Water	Length	Total B.T.U. Per Hr.	Rated Surface Sq. Ft.	E.D.R.–Sq. Ft.	B.T.U. Per Sq. Ft.	R.C. Steam or Water	Total B.T.U. Per Hr.	Rated Surface Sq. Ft.	E.D.R.–Sq. Ft.	B.T.U. Per Sq. Ft.	R.C. Steam or Water
1	2.5	770	2	3.19	385	.77	.79	1100	2.67	4.55	413	.69	.71	1372	3.75	5.68	366	.75	.77	3	1739	5	7.16	346	.82	1128	2.67	4.67	423	.73
2	5.0	1293	4	5.35	323	.92	.94	1736	5.33	7.18	326	.88	.90	2195	7.50	9.08	293	.94	.97	6	2808	10	11.62	281	1.01	1813	5.33	7.50	340	.92
3	7.5	1807	6	7.48	301	.99	1.01	2373	8.00	9.82	297	.96	.99	3017	11.25	12.48	268	1.02	1.05	9	3887	15	16.08	259	1.09	2498	8.00	10.34	312	1.00
4	10.0	2321	8	9.60	290	1.02	1.05	3010	10.67	12.45	282	1.01	1.04	3849	15.00	15.89	256	1.07	1.10	12	4964	20	20.56	248	1.14	3179	10.67	13.15	298	1.04
5	12.5	2835	10	11.73	284	1.05	1.08	3652	13.33	15.11	276	1.04	1.01	4661	18.75	19.28	249	1.10	1.14	15	6049	25	25.00	242	1.17	3864	13.33	15.99	290	1.07
6	15.0	3348	12	13.85	279	1.06	1.10	4289	16.00	17.75	268	1.06	1.04	5485	22.50	22.69	244	1.12	1.16	18	7122	30	29.47	237	1.19	4547	16.00	18.81	284	1.09
7	17.5	3863	14	15.98	276	1.08	1.11	4928	18.67	20.36	264	1.08	1.11	6308	26.25	26.10	240	1.16	1.18	21	8198	35	33.92	234	1.21	5228	18.67	21.63	280	1.11
8	20.0	4377	16	18.11	274	1.09	1.12	5560	21.33	23.00	261	1.09	1.12	7128	30.00	29.49	238	1.15	1.19	24	9276	40	38.38	232	1.22	5913	21.33	24.46	277	1.12
9	22.5	4891	18	20.24	272	1.09	1.13	6197	24.00	25.64	258	1.10	1.13	7952	33.75	32.90	236	1.16	1.20	27	10355	45	42.84	230	1.23	6600	24.00	27.31	275	1.13
10	25.0	5404	20	22.36	270	1.10	1.13	6832	26.67	28.27	256	1.11	1.14	8775	37.50	36.31	234	1.17	1.21	30	11435	50	47.31	229	1.24	7282	26.67	30.13	273	1.14
11	27.5	5918	22	24.48	269	1.10	1.14	7471	29.33	30.91	255	1.12	1.15	9595	41.25	39.70	233	1.18	1.21	33	12513	55	51.77	228	1.24	7966	29.33	32.96	272	1.15
12	30.0	6432	24	26.61	268	1.11	1.14	8109	32.00	33.59	253	1.13	1.16	10418	45.00	43.10	232	1.18	1.22	36	13592	60	56.23	227	1.25	8650	32.00	35.79	270	1.15
13	32.5	6947	26	28.74	267	1.11	1.14	8746	34.67	36.19	252	1.13	1.16	11242	48.75	46.51	231	1.19	1.23	39	14671	65	60.70	226	1.25	9330	34.67	38.60	269	1.16
14	35.0	7459	28	30.86	266	1.11	1.15	9383	37.33	38.82	251	1.14	1.17	12065	52.50	49.92	230	1.19	1.23	42	15750	70	65.16	225	1.26	10016	37.33	41.44	268	1.16
15	37.5	7974	30	32.99	266	1.12	1.15	10026	40.00	41.46	251	1.14	1.17	12889	56.25	53.33	229	1.20	1.23	45	16827	75	69.62	224	1.26	10696	40.00	44.25	267	1.16
16	40.0	8489	32	35.12	265	1.12	1.15	10662	42.67	44.11	250	1.14	1.17	13710	60.00	56.72	229	1.20	1.24	48	17904	80	74.08	224	1.26	11378	42.67	47.07	267	1.17
17	42.5	9004	34	37.24	265	1.12	1.15	11299	45.33	46.75	249	1.15	1.18	14531	63.75	60.12	228	1.20	1.24	51	18981	85	78.53	223	1.27	12062	45.33	49.90	266	1.17
18	45.0	9515	36	39.37	264	1.12	1.15	11933	48.00	48.37	249	1.15	1.18	15353	67.50	63.52	228	1.20	1.24	54	20057	90	83.00	223	1.27	12744	48.00	52.73	266	1.17
19	47.5	10028	38	41.49	264	1.12	1.16	12570	50.67	52.01	248	1.15	1.18	16174	71.25	66.92	227	1.21	1.24	57	21140	95	87.46	223	1.27	13425	50.67	55.56	265	1.17
20	50.0	10544	40	43.62	264	1.13	1.16	13211	53.33	54.66	248	1.15	1.18	16995	75.00	70.31	227	1.21	1.25	60	22330	100	91.93	222	1.27	14111	53.33	58.38	265	1.17
		5½" Wide				1.30	1.34	8½" Wide				1.25	1.28	10" Wide				1.28	1.24		11¼" Wide				1.24	8½" Wide				1.36

Radiation Computing—26-in. Radiators. No. 13-XX

For 26-In Radiators



RADIATION COMPUTING
The Reynolds Tables

In the following tables, the actual cost paid per square foot of surface of a 3-col. 38 in. 10-section steam-type radiator is 1.00 and it emits 228 B.T.U. per square foot per hour, while the actual cost for the same radiator 18 in. high is 1.43 and the heat emission is 252 B.T.U. The cost per square foot actually paid (see vertical figures at bottom of tables) for the radiator 18 in. high is 43% more than for the one 38 in. high, but with the increased heat emission of 10½% taken into account, the relative cost per square foot of the radiator 18 in. high is only (1.43 ÷ 1.105 = 1.29) 29% greater.

As an example of how to select the cheapest radiator, assume a heat loss from a room of 11,250 B.T.U. Glancing over each column of relative costs it will be found that a 2-col. 26-in. 17-section radiator has a relative cost of 1.15 and is cheapest for radiation 26 in. high. If the height is not a limiting factor, then a 1-col. 38-in. 15 section has the lowest relative cost (R. C. — 0.98) with 2-col., 38-in. 12-section or 3-col., 38-in. 10-section almost as cheap (R. C. — 1.00).

CONVERSION FACTORS FOR OTHER STEAM AND ROOM TEMPERATURES

A table of conversion factors (See Data Sheet No. 13-TT), may be used to obtain data for other steam or room temperatures. For example, at 215° F. steam temperature and 70° F. room temperature, a 4-col., 18-in. radiator of 14 sections, or 42 sq. ft. of rated surface, will transmit a total of 10,198 B.T.U. per hour (see Data Sheet No. 13-VV) at a relative cost of 1.39, but 12 sections (36 sq. ft.) of this radiator will give the same heat emission at a steam temperature of 227° (5 lbs. gage) and room temperature of 60°. The proper conversion factor for the latter temperature conditions (0.864), multiplied by 10,198, equals 8811 B.T.U., a total heat emission corresponding to that of the 12-section radiator at the former temperature conditions (Data Sheet No. 13-VV).

The relative cost at the new temperatures will remain as before (1.38), providing the same radiator is taken as the base at the new temperatures, but if compared with that at the first temperatures, the relative cost drops to (1.38 × 0.864) = 1.19. This cost may be obtained in another way, thus: 10,198 B.T.U. ÷ 86 sq. ft. = 2.83 B.T.U., the new efficiency. As this is an increase of 24% over the base of 242 B.T.U., the actual cost paid of 1.47, divided by 1.24, will give a relative cost of 1.19.

This decrease in relative cost shows the economies which may be obtained by increasing either the steam temperature or room temperature. In the example given a saving is made of 6 sq. ft. of radiation or a reduction of approximately 14% ($3.14 at prices of 1923) effected in the actua l cost of the radiator. Incidentally, increasing the steam temperature increases the efficiencies and reduces the relative costs more rapidly than reducing the room temperature.

The E.D.R. (equivalent direct radiation) also remains as given in the table (36.42 sq. ft.), unless comparison is made with the original temperatures, in which case it should be divided by 0.864, or the new E.D.R. may be selected direct from the table, thus, 42.19 appears under the heading E.D.R. opposite 10,198 B.T.U.

EXPLANATION OF ABBREVIATIONS USED.

R.C. — Relative cost per square foot, based on heating efficiency with 3-col., 38-in., 10-sec. steam-type radiation as 1.0. Given for each of 1 to 20 sections. Below this, in vertical figures, the cost actually paid where the heating efficiency is not considered. The latter cost is relative to 3-col., 38-in. steam-type radiation taken as 1.00, but unlike the relative cost, it does not vary with the number of sections. To save confusion it is hereafter referred to as actual cost.

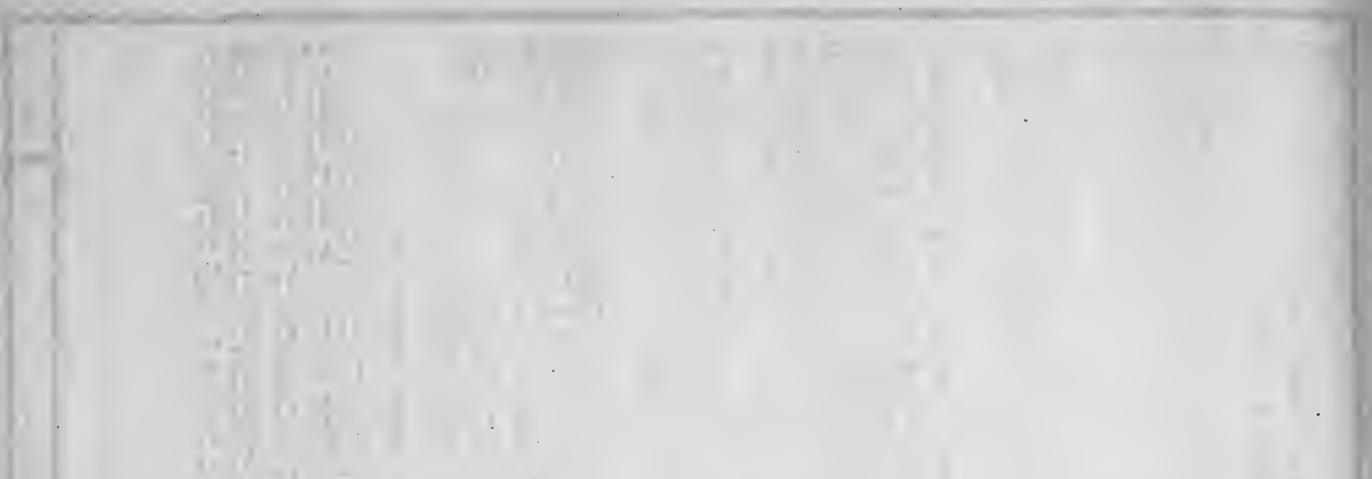
E.D.R. — Equivalent direct radiation, based on 241.7 B.T.U. per square foot for 2-col., 38-in., 10-sec. radiator. For example, the rated external surface and the E.D.R. for this radiator are both 40 sq. ft., but for a 4-col., 45-in., 4-sec. radiator, the E.D.R. would be 36.47 sq. ft. instead of 40, as the efficiency or B.T.U. per square foot is only 220.

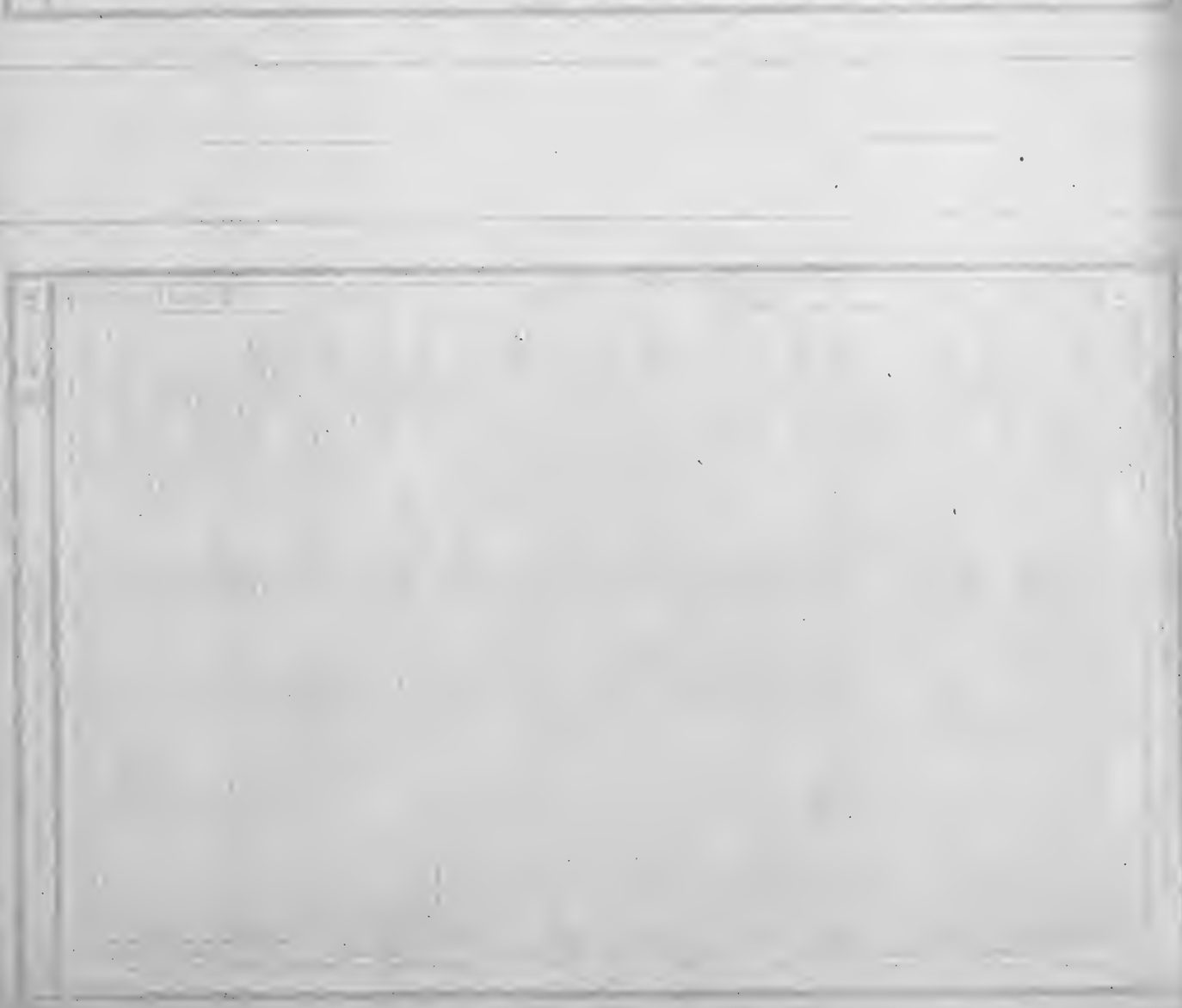
Continued on Data Sheet No. 13-VV

RADIATION COMPUTING—THE REYNOLDS TABLES
Comparative Costs and Heat Emission for 18-in. and 20-in. Radiators

Steam Temp. 215° F. Room Temp. 70° F.

	No. of Sections	Length	1 Col. Total B.T.U. Per Hr.	1 Col. Rated Surface Sq. Ft.	1 Col. E.D.R.–Sq. Ft.	1 Col. B.T.U. Per Sq. Ft.	1 Col. R.C. Steam	1 Col. R.C. Water	2 Col. Total B.T.U. Per Hr.	2 Col. Rated Surface Sq. Ft.	2 Col. E.D.R.–Sq. Ft.	2 Col. B.T.U.Per Sq. Ft.	2 Col. R.C. Steam	2 Col. R.C. Water	3 Col. Total B.T.U. Per Hr.	3 Col. Rated Surface Sq. Ft.	3 Col. E.D.R.–Sq. Ft.	3 Col. B.T.U. Per Sq. Ft.	3 Col. R.C. Steam	3 Col. R.C. Water
5½ Wide x 20" High	1	2.5	599	1.5	2.45	395	.86	.88	823	2	3.41	412	.79	.81	978	2.25	3.63	390	.84	.86
[1.48] [1.53]	2	5.0	982	3.0	4.00	327	[1.04]	[1.07]	1313	4	5.43	328	[.99]	[1.02]	1430	4.50	5.92	318	[1.03]	[1.06]
	3	7.5	1377	4.5	5.70	306	[1.11]	[1.14]	1810	6	7.49	302	[1.08]	[1.11]	1961	6.75	8.13	291	[1.12]	[1.16]
	4	10.0	1772	6.0	7.33	295	[1.15]	[1.19]	2304	8	9.53	288	[1.13]	[1.16]	2491	9.00	10.31	277	[1.18]	[1.22]
	5	12.5	2166	7.5	8.97	289	[1.17]	[1.21]	2798	10	11.59	280	[1.17]	[1.20]	3020	11.25	12.49	268	[1.22]	[1.25]
	6	15.0	2562	9.0	10.60	285	[1.19]	[1.23]	3292	12	13.62	274	[1.19]	[1.22]	3553	13.50	14.70	263	[1.24]	[1.28]
	7	17.5	2957	10.5	12.23	282	[1.20]	[1.24]	3786	14	15.66	270	[1.21]	[1.24]	4084	15.75	16.90	259	[1.26]	[1.30]
	8	20.0	3353	12.0	13.87	279	[1.21]	[1.25]	4279	16	17.70	267	[1.23]	[1.25]	4615	18.00	19.09	256	[1.27]	[1.31]
	9	22.5	3748	13.5	15.51	278	[1.22]	[1.26]	4772	18	19.74	265	[1.23]	[1.26]	5146	20.25	21.29	254	[1.28]	[1.32]
	10	25.0	4143	15.0	17.14	276	[1.23]	[1.26]	5264	20	21.78	263	[1.24]	[1.27]	5679	22.50	23.50	252	[1.29]	[1.33]
	11	27.5	4538	16.5	18.78	275	[1.23]	[1.27]	5757	22	23.80	262	[1.25]	[1.29]	6210	24.75	25.69	251	[1.30]	[1.34]
	12	30.0	4932	18.0	20.41	274	[1.24]	[1.27]	6245	24	25.84	260	[1.25]	[1.29]	6742	27.00	27.89	250	[1.31]	[1.35]
	13	32.5	5327	19.5	22.04	273	[1.24]	[1.28]	6739	26	27.88	259	[1.26]	[1.29]	7273	29.25	30.09	249	[1.31]	[1.35]
	14	35.0	5723	21.0	23.68	273	[1.24]	[1.28]	7232	28	29.92	258	[1.26]	[1.30]	7803	31.50	32.28	248	[1.32]	[1.36]
	15	37.5	6118	22.5	25.31	272	[1.25]	[1.29]	7726	30	31.97	258	[1.27]	[1.30]	8333	33.75	34.48	247	[1.32]	[1.36]
	16	40.0	6514	24.0	26.95	271	[1.25]	[1.29]	8221	32	34.01	257	[1.27]	[1.30]	8863	36.00	36.67	246	[1.32]	[1.37]
	17	42.5	6908	25.5	28.59	271	[1.25]	[1.29]	8714	34	36.05	256	[1.27]	[1.31]	9398	38.25	38.87	246	[1.33]	[1.37]
	18	45.0	7304	27.0	30.22	271	[1.25]	[1.29]	9209	36	38.09	256	[1.28]	[1.31]	9931	40.50	41.06	245	[1.33]	[1.37]
	19	47.5	7697	28.5	31.85	270	[1.25]	[1.29]	9703	38	40.14	255	[1.28]	[1.31]	10466	42.75	43.25	245	[1.33]	[1.37]
	20	50.0	8094	30.0	33.49	270	[1.26]	[1.30]	10196	40	42.18	255	[1.28]	[1.31]	10999	45.00	45.51	244	[1.34]	[1.38]
5½ Wide x 18" High																				
[1.43] [1.47]																				
	3	7.5	1125	3	4.65	375	.90	.92	1823	6	7.54	304	1.11	1.14	2522	9	10.43	280	1.25	1.29
	4	10.0	1521	4	6.19	380	1.11	1.14	2472	8	10.05	309	1.10	1.13	3218	12	13.31	268	1.25	1.29
	5	12.5	1917	5	7.73	386	1.29	1.33	3121	10	12.57	312	1.29	1.33	4065	15	16.21	271	1.39	1.43
	6	15.0	2313	6	9.27	390	1.31	1.35	3770	12	15.08	314	1.31	1.35	4913	18	19.09	266	1.41	1.45
	7	17.5	2707	7	10.80	386	1.32	1.36	4419	14	17.60	314	1.33	1.37	5760	21	21.98	263	1.43	1.47
	8	20.0	3103	8	12.34	385	1.33	1.37	5068	16	20.12	314	1.35	1.39	6611	24	24.87	261	1.44	1.48
	9	22.5	3498	9	13.88	385	1.34	1.38	5717	18	22.64	314	1.36	1.40	7459	27	27.76	260	1.45	1.49
	10	25.0	3893	10	15.41	385	1.35	1.39	6366	20	25.16	314	1.37	1.41	8307	30	30.63	257	1.46	1.50
	11	27.5	4288	11	16.95	385	1.36	1.40	7015	22	27.68	314	1.38	1.42	9156	33	33.53	256	1.47	1.51
	12	30.0	4682	12	18.48	384	1.37	1.41	7664	24	30.20	314	1.39	1.43	10005	36	36.42	255	1.48	1.52
	13	32.5	5077	13	20.02	384	1.38	1.42	8313	26	32.72	314	1.40	1.44	10854	39	39.31	255	1.49	1.53
	14	35.0	5473	14	21.56	384	1.39	1.43	8962	28	35.24	314	1.41	1.45	11703	42	42.19	253	1.50	1.54
	15	37.5	5868	15	23.09	384	1.40	1.44	9611	30	37.76	314	1.42	1.46	12552	45	45.08	252	1.50	1.54
	16	40.0	6264	16	24.63	384	1.41	1.45	10260	32	40.28	314	1.43	1.47	13401	48	47.96	252	1.50	1.54
	17	42.5	6658	17	26.17	384	1.42	1.46	10909	34	42.80	314	1.44	1.48	14250	51	50.85	250	1.50	1.54
	18	45.0	7054	18	27.70	384	1.43	1.47	11558	36	45.32	314	1.45	1.49	15099	54	53.73	249	1.50	1.54
	19	47.5	7447	19	29.24	384	1.44	1.48	12207	38	47.84	314	1.46	1.50	15948	57	56.62	249	1.50	1.54
	20	50.0	7844	20	30.78	384	1.45	1.49	12856	40	50.36	314	1.47	1.51	16797	60	59.50	249	1.50	1.54
8½ Wide x 20" High																				
[1.43] [1.47]																				
	1	2.5	599	1.5	2.45	395	.86	.88	823	2	3.41	412	.79	.81	978	2.25	3.63	390	.84	.86
	2	5.0	982	3.0	4.00	327	[1.04]	[1.07]	1313	4	5.43	328	[.99]	[1.02]	1430	4.50	5.92	318	[1.03]	[1.06]
	3	7.5	1377	4.5	5.70	306	[1.11]	[1.14]	1810	6	7.49	302	[1.08]	[1.11]	1961	6.75	8.13	291	[1.12]	[1.16]
	4	10.0	1772	6.0	7.33	295	[1.15]	[1.19]	2304	8	9.53	288	[1.13]	[1.16]	2491	9.00	10.31	277	[1.18]	[1.22]
	5	12.5	2166	7.5	8.97	289	[1.17]	[1.21]	2798	10	11.59	280	[1.17]	[1.20]	3020	11.25	12.49	268	[1.22]	[1.25]
	6	15.0	2562	9.0	10.60	285	[1.19]	[1.23]	3292	12	13.62	274	[1.19]	[1.22]	3553	13.50	14.70	263	[1.24]	[1.28]
	7	17.5	2957	10.5	12.23	282	[1.20]	[1.24]	3786	14	15.66	270	[1.21]	[1.24]	4084	15.75	16.90	259	[1.26]	[1.30]
	8	20.0	3353	12.0	13.87	279	[1.21]	[1.25]	4279	16	17.70	267	[1.23]	[1.25]	4615	18.00	19.09	256	[1.27]	[1.31]
	9	22.5	3748	13.5	15.51	278	[1.22]	[1.26]	4772	18	19.74	265	[1.23]	[1.26]	5146	20.25	21.29	254	[1.28]	[1.32]
	10	25.0	4143	15.0	17.14	276	[1.23]	[1.26]	5264	20	21.78	263	[1.24]	[1.27]	5679	22.50	23.50	252	[1.29]	[1.33]
	11	27.5	4538	16.5	18.78	275	[1.23]	[1.27]	5757	22	23.80	262	[1.25]	[1.29]	6210	24.75	25.69	251	[1.30]	[1.34]
	12	30.0	4932	18.0	20.41	274	[1.24]	[1.27]	6245	24	25.84	260	[1.25]	[1.29]	6742	27.00	27.89	250	[1.31]	[1.35]
	13	32.5	5327	19.5	22.04	273	[1.24]	[1.28]	6739	26	27.88	259	[1.26]	[1.29]	7273	29.25	30.09	249	[1.31]	[1.35]
	14	35.0	5723	21.0	23.68	273	[1.24]	[1.28]	7232	28	29.92	258	[1.26]	[1.30]	7803	31.50	32.28	248	[1.32]	[1.36]
	15	37.5	6118	22.5	25.31	272	[1.25]	[1.29]	7726	30	31.97	258	[1.27]	[1.30]	8333	33.75	34.48	247	[1.32]	[1.36]
	16	40.0	6514	24.0	26.95	271	[1.25]	[1.29]	8221	32	34.01	257	[1.27]	[1.30]	8863	36.00	36.67	246	[1.32]	[1.37]
	17	42.5	6908	25.5	28.59	271	[1.25]	[1.29]	8714	34	36.05	256	[1.27]	[1.31]	9398	38.25	38.87	246	[1.33]	[1.37]
	18	45.0	7304	27.0	30.22	271	[1.25]	[1.29]	9209	36	38.09	256	[1.28]	[1.31]	9931	40.50	41.06	245	[1.33]	[1.37]
	19	47.5	7697	28.5	31.85	270	[1.25]	[1.29]	9703	38	40.14	255	[1.28]	[1.31]	10466	42.75	43.25	245	[1.33]	[1.37]
	20	50.0	8094	30.0	33.49	270	[1.26]	[1.30]	10196	40	42.18	255	[1.28]	[1.31]	10999	45.00	45.51	244	[1.34]	[1.38]
8½ Wide x 18" High																				
[1.43] [1.47]																				
	3	7.5	1125	3	4.65	375	.90	.92	1823	6	7.54	304	1.11	1.14	2522	9	10.43	280	1.25	1.29
	4	10.0	1521	4	6.19	380	1.11	1.14	2472	8	10.05	309	1.10	1.13	3218	12	13.31	268	1.25	1.29
	5	12.5	1917	5	7.73	386	1.29	1.33	3121	10	12.57	312	1.29	1.33	4065	15	16.21	271	1.39	1.43
	6	15.0	2313	6	9.27	390	1.31	1.35	3770	12	15.08	314	1.31	1.35	4913	18	19.09	266	1.41	1.45
	7	17.5	2707	7	10.80	386	1.32	1.36	4419	14	17.60	314	1.33	1.37	5760	21	21.98	263	1.43	1.47
	8	20.0	3103	8	12.34	385	1.33	1.37	5068	16	20.12	314	1.35	1.39	6611	24	24.87	261	1.44	1.48
	9	22.5	3498	9	13.88	385	1.34	1.38	5717	18	22.64	314	1.36	1.40	7459	27	25.76	260	1.45	1.49
	10	25.0	3893	10	15.41	385	1.35	1.39	6366	20	25.16	314	1.37	1.41	8307	30	30.63	247	1.34	1.38
	11	27.5	4288	11	16.95	385	1.36	1.40	7015	22	27.68	314	1.38	1.42	9156	33	33.53	246	1.37	1.41
	12	30.0	4682	12	18.48	384	1.37	1.41	7664	24	30.20	314	1.39	1.43	10005	36	36.42	245	1.38	1.42
	13	32.5	5077	13	20.02	384	1.38	1.42	8313	26	32.72	314	1.40	1.44	10854	39	39.31	244	1.39	1.43
	14	35.0	5473	14	21.56	384	1.39	1.43	8962	28	35.24	314	1.41	1.45	11703	42	42.19	243	1.39	1.43
	15	37.5	5868	15	23.09	384	1.40	1.44	9611	30	37.76	314	1.42	1.46	12552	45	45.08	242	1.39	1.43
	16	40.0	6264	16	24.63	384	1.41	1.45	10260	32	40.28	314	1.43	1.47	13401	48	47.96	242	1.39	1.43
	17	42.5	6658	17	26.17	384	1.42	1.46	10909	34	42.80	314	1.44	1.48	14250	51	50.85	240	1.40	1.44
	18	45.0	7054	18	27.70	384	1.43	1.47	11558	36	45.32	314	1.45	1.49	15099	54	53.73	241	1.40	1.44
	19	47.5	7447	19	29.24	384	1.44	1.48	12207	38	47.84	314	1.46	1.50	15948	57	56.62	240	1.40	1.44
	20	50.0	7844	20	30.78	384	1.45	1.49	12856	40	50.36	314	1.47	1.51	16797	60	59.50	240	1.40	1.44
8½ Wide x 20" High																				
[1.43] [1.47]																				
	1	2.5	599	1.5	2.45	395	.86	.88	823	2	3.41	412	.79	.81	978	2.25	3.63	390	.84	.86
	2	5.0	982	3.0	4.00	327	[1.04]	[1.07]	1313	4	5.43	328	[.99]	[1.02]	1430	4.50	5.92	318	[1.03]	[1.06]
	3	7.5	1377	4.5	5.70	306	[1.11]	[1.14]	1810	6	7.49	302	[1.08]	[1.11]	1961	6.75	8.13	291	[1.12]	[1.16]
	4	10.0	1772	6.0	7.33	295	[1.15]	[1.19]	2304	8	9.53	288	[1.13]	[1.16]	2491	9.00	10.31	277	[1.18]	[1.22]
	5	12.5	2166	7.5	8.97	289	[1.17]	[1.21]	2798	10	11.59	280	[1.17]	[1.20]	3020	11.25	12.49	268	[1.22]	[1.25]
	6	15.0	2562	9.0	10.60	285	[1.19]	[1.23]	3292	12	13.62	274	[1.19]	[1.22]	3553	13.50	14.70	263	[1.24]	[1.28]
	7	17.5	2957	10.5	12.23	282	[1.20]	[1.24]	3786	14	15.66	270	[1.21]	[1.24]	4084	15.75	16.90	259	[1.26]	[1.30]
	8	20.0	3353	12.0	13.87	279	[1.21]	[1.25]	4279	16	17.70	267	[1.23]	[1.25]	4615	18.00	19.09	256	[1.27]	[1.31]
	9	22.5	3748	13.5	15.51	278	[1.22]	[1.26]	4772	18	19.74	265	[1.23]	[1.26]	5146	20.25	21.29	254	[1.28]	[1.32]
	10	25.0	4143	15.0	17.14	276	[1.23]	[1.26]	5264	20	21.78	263	[1.24]	[1.27]	5679	22.50	23.50	252	[1.29]	[1.33]
	11	27.5	4538	16.5	18.78	275	[1.23]	[1.27]	5757	22	23.80	262	[1.25]	[1.29]	6210	24.75	25.69	251	[1.30]	[1.34]
	12	30.0	4932	18.0	20.41	274	[1.24]	[1.27]	6245	24	25.84	260	[1.25]	[1.29]	6742	27.00	27.89	250	[1.31]	[1.35]
	13	32.5	5327	19.5	22.04	273	[1.24]	[1.28]	6739	26	27.88	259	[1.26]	[1.29]	7273	29.25	30.09	249	[1.31]	[1.35]
	14	35.0	5723	21.0	23.68	273	[1.24]	[1.28]	7232	28	29.92	258	[1.26]	[1.30]	7803	31.50	32.28	248	[1.32]	[1.36]
	15	37.5	6118	22.5	25.31	272	[1.25]	[1.29]	7726	30	31.97	258	[1.27]	[1.30]	8333	33.75	34.48	247	[1.32]	[1.36]
	16	40.0	6514	24.0	26.95	271	[1.25]	[1.29]	8221	32	34.01	257	[1.27]	[1.30]	8863	36.00	36.67	246	[1.32]	[1.37]
	17	42.5	6908	25.5	28.59	271	[1.25]	[1.29]	8714	34	36.05	256	[1.27]	[1.31]	9398	38.25	38.87	246	[1.33]	[1.37]
	18	45.0	7304	27.0	30.22	271	[1.25]	[1.29]	9209	36	38.09	256	[1.28]	[1.31]	9931	40.50	41.06	245	[1.33]	[1.37]
	19	47.5	7697	28.5	31.85	270	[1.25]	[1.29]	9703	38	40.14	255	[1.28]	[1.31]	10466	42.75	43.25	245	[1.33]	[1.37]
	20	50.0	8094	30.0	33.49	270	[1.26]	[1.30]	10196	40	42.18	255	[1.28]	[1.31]	10999	45.00	45.51	244	[1.34]	[1.38]





that make use of the heat before it leaves the stack.

BUYING VERSUS GENERATING ELECTRIC CURRENT

"I believe that in plants using 300 KW or more and in cases where exhaust steam can be put to good use, it is still possible to generate current cheaper than it can be purchased. How long this will continue to be the case is a question. Certainly the tendency is to the general use of public service power. There are a good many things which accelerate this tendency. Good salesmanship on the part of representatives of the power companies, the uncertainty of fuel supply, unsatisfactory labor and a desire on the part of executives to be relieved of responsibilities outside of the main line of their commercial enterprise. Greater than all these are the items of first cost and space requirements, and a feeling that the while subject of power development is in a state of flux. An installation which is up-to-date to-day may be obsolete long before it is worn out. Men engaged in commercial lines, the men who erect large city buildings, would rather have a definite contract for power than take chances on the installation of a power plant.

"We may therefore expect in the future that fuel will be used in commercial buildings largely, if not exclusively, for the purpose of heating and that brings us to several questions which our brothers of the heating and ventilating fraternity should consider.

"In the first place, most of these heating plants use low-pressure steam. There is only a small difference in actual thermal value between low and high-pressure, but does it pay to generate at high-pressure and then reduce it to 4 or 5 lbs. for heating. High-pressure steam is needed for bringing the oil to the proper temperature for spraying. It would seem to me that if mechanical burners are used, a separate high-pressure unit should be installed in all cases and the boilers used for heating purposes.

RECOVERY OF HEAT FROM STACK

"There is another point that I am going to call to the attention of the heating and ventilating fraternity. In power plants there is now a great demand for the recovery of the lost heat from the stack case. I do not know of any plant in New York where there is any attempt made to do this. All this is recoverable for heating purposes because we can place stack radiators and recover that heat for use in the building, by use of a fan, and it is very available for ventilating purpose. That may bring us down to a point where we will have to have force draft.

THE FUEL SUPPLY OUTLOOK

"Oil at present represents a very small fraction of the city's fuel. The oil companies are already hedging as to future prices and future deliveries. I believe that I am safe in making the statement that when the B. T. U. price of oil is less than the B.T.U. price of coal in New York, the market is abnormal. If we do not actually experience oil shortage, we may certainly expect a time when the overall cost of oil firing will equal the overall cost of coal firing. Even then, many users will prefer oil.

"The question of our vanishing oil supply is one about which there has been a great deal of discussion The supply of oil is undoubtedly more uncertain than the supply of coal. We really have no positive information on which to base an estimate. Thirty years ago we always thought of oil as produced in Pennsylvania. Now only a fraction of the supply comes from that State. We know that an enormous amount of money has been wasted in unprofitable drilling. We also know that a great deal has been made by successful drilling and that the industry is closely controlled.

"Refiners are all working toward an increased production of gasoline. This means a lessened supply of fuel-oil. Our refiner has put forth the statement that within five years crude oil will be cracked so as to yield only gasoline and coal tar. I do not think such a condition will come to pass. The advantages of liquid fuel have been demonstrated and the demand will be supplied. Synthetic liquid fuel is a reasonable possibility. This is a problem for the chemists. Find a method of increasing the hydrogen in heavy hydrocarbon or even of hydrogenating solid carbon. This is done in nature, I have faith to believe it will be accomplished artificially.

"At present there is being produced in the United States a little over one barrel of oil for every ton of coal mined. This does not mean that we have anything like that amount of fuel-oil available. Not more than 20% of the total is available for fuel. It is therefore out of the question to talk about oil taking the place of coal as a fuel.

PLANTS MUST PROVIDE FOR COAL FIRING

"Under present conditions, it is certainly necessary to provide for coal firing in case the oil supply is cut off, or in case the price of oil becomes prohibitive. In a great many cases this item is not given proper attention. The only provision made for burning coal is to take out the burners and install grates, an operation which requires some labor and takes time. After this the furnaces have to be hand-fired through the burner openings. This arrangement is unsatisfactory and is only tolerable as an emergency makeshift.

OIL-BURNING FURNACES SUITABLE FOR PULVERIZED COAL

"While one body of engineers has been working on fuel-oil burning, another body has been developing equipment for burning pulverized coal. It is interesting to note that furnaces suitable for fuel-oil are also suitable for pulverized coal and that a change-over can be made without alteration and firing continued with the same boiler room force employed to manage the oil.

"Before closing we might make some reference to the regulations of the city for the storage of fuel-oil. These regulations were at first very cumbersome. They are now being straightened out. The first thing is the question of tanks. The rules at present allow for a very light shell on tanks of large diameter. Most engineers prefer to make their tanks heavier than the requirements of the city department. For instance they allow a 5/16-in. shell on a tank of 12 ft. diameter. There is no real danger of a tank breaking and of the space being flooded with oil. There is a certain danger from small leaks of rivets and seams, which might make puddles and become dangerous. The original idea of enclosures of tanks was that these enclosures should be oil tight. It was thought necessary to build another concrete tank around the containers. The only object of an enclosure about a tank is to protect the tank from a fire which might occur in a building.

"The way a tank should be enclosed is really a matter of how it is located, what things are adjacent to it and what the fire risk is. We find, however, that the rules now call for an enclosure 1 ft. away from the tank and this must be filled with sand. Many practical men object to this, because putting in the sand simply conceals any leak there might be.

"I think that owners could be saved a great deal of expense if this matter of enclosure was rediscussed and some modifications made in it. Aside from that, I see no objection to the fuel-oil regulations as they exist. There will of course, come a time when there will be better co-operation between the fuel-oil men and the city authorities."

Among those who discussed the paper was Reginald Pelham Bolton who told of an oil-burning system he was operating in a Fifth Avenue building which was installed at a cost of $18,500. "We have a contract," he continued, "for 20,000 barrels of oil at 3¼c that have to be used this year, and we can buy coal at $4.61, so you can see where we have a loss of about $7,000 facing us for the year's operation."

Mr. Bolton expressed the opinion that as time goes on power plants in city buildings must give way to systems of low-pressure operation. He also made reference to the fact that space is becoming more valuable than ever, and instanced the case where a dry goods

merchant made the remark that if he could have the engine room cleared he would pay $10,000 a year for the extra space.

"In changing," added Mr. Bolton, "the elimination of every high-pressure element is necessary for a real economy in the plant. Therefore we are changing over hotels, apartment houses, dry goods stores, etc., so that the boilers operate only at the heating pressure. Wherever a small amount of steam is required, we put in a gas-heated boiler. It pays to burn gas rather than establish a high-pressure unit in your boiler room. The question of the advantages that go with the burning of oil is doubtless one that has to be considered. A number of them have taken up the burning of oil regardless of expense because it did away with the question of ashes."

Horizontal Steam Supply Run-outs to Radiators with Counterflowing Condensation

One of the conclusions reached in the tests conducted by Warren Webster & Company, of Camden, N. J., in its research laboratory, in connection with the counterflow of condensation in horizontal steam supply run-outs to radiators, is that the steam velocity alone is not a sufficient criterion. The volume of the condensation and the variation in density of steam, it has been found, both have a decided effect upon the problem. This is true of two-pipe systems, as well as of one-pipe systems.

The water flowing in the radiator run-out comes from the steam which is condensed in its passage through the pipe, plus any entrained water. The amount of condensation taking place depends upon the length of the pipe and the heat transmission through it. The depth of the counterflowing water affects the free area of the pipe and consequently the velocity of a given volume of steam flowing past the point of restriction. Therefore the longer the pipe, other things being equal, the greater the quantity of condensation and the less the permissible steam flow.

When the flow may be observed through glass tubes, as is the case in the tests conducted at the Webster Research Laboratory, it is easily seen that the retarding effect of the steam upon the counterflowing water is apparently greater within a short distance from the point where the run-out joined the supply riser. From this brief statement it will be seen that "critical velocity" alone is not a sufficient measure with which to determine the capacity of any given pipe at a given grade.

"CRITICAL VELOCITY" AN INACCURATE DESCRIPTION OF CONDITIONS

Moreover the term "critical velocity," it is stated, is an inaccurate description of a state or condition existing within the pipe which may be described as follows: As the volume of steam flowing through a horizontal run-out pipe increases, there comes a time when the condensation no longer flows against the steam but instead is carried along with it, and the steam flow enters a critical condition or state. As the rate of steam flow still further increases the accumulation of water continues to surge in the pipes and the condition becomes more critical. With further increases the condensation is swept along the horizontal pipe, up the vertical pipe and into the radiator, when the critical condition ceases.

If the demand for steam was always uniform and was not at times much less than normal it would be possible to use smaller sizes for horizontal supply run-outs, and uptakes to two-pipe radiators and continuously sweep the condensation up into the radiators without material increase in pressure drop.

If however these small pipes were employed and for any reason the heat emission from the radiator became less than normal a serious condition of noise and obstruction to steam flow would occur.

In practice there is no assurance that the assumed grade of the horizontal run-outs will be strictly adhered to in every case. The condensation rate when steam is turned on to a cold radiator will be much higher than normal. It is good practice therefore, to provide a liberal margin of safety in sizing all run-outs for counterflowing condensation.

If some gurgling noise, when first admitting steam is not objectionable, it may be safe to use a lower factor of safety, allowing a smaller margin beyond that at which the steam flow at normal volume will enter the critical state. But there is always the likelihood that the pipes will not have the pitch or slope expected, especially after the piping system is completely heated and fully expanded. Therefore in all cases it is wise to allow liberal margin.

Maximum flow, pitch of pipes and factors of safety are all matters of engineering judgment to be determined by a responsible engineer who thereafter should accept the responsibility should gurgling noises develop through failure of continuous counterflow. Now that one of the principal causes of these unpleasant sounds is recognized, the blame should not be so universally laid to the valve and trap fixtures attached to the radiators.

An inefficient radiator trap which prevents the full heating efficiency of the radiator might *prevent* the noise by lessening the steam flow, whereas with a more efficient device and full radiator efficiency the noise would occur.

Since the steam density increases with the pressure, a somewhat greater amount of effective heat may be conveyed at a lower velocity through a run-out pipe at a given grade, without entering the critical state, at say 10 lbs. gauge pressure than at 1 lb.

TABLE NO. 1

Pitch of Pipe	¾ in. Nominal Diameter Internal Area 0.448 Sq. In. Pounds per hour	1 in. Nominal Diameter Internal Area 0.835 Sq. In. Pounds per hour
2 in. in 10 ft.	10.40	19.0
1½ in. in 10 ft.	9.70	17.5
1 in. in 10 ft.	8.40	15.5
½ in. in 10 ft.	7.50	12.3

TABLE NO. 2

Pitch of Pipe	¾-Inch Steel Pipe Standard Weight Internal Area 0.53 Sq. In. Pounds per hour	Extra Heavy Weight Internal Area 0.43 Sq. In. Pounds per hour
2 in. in 10 ft.	9.8	7.9
1½ in. in 10 ft.	9.0	7.0
1 in. in 10 ft.	7.8	5.7
½ in. in 10 ft.	5.9	4.0

Pitch of Pipe	1-Inch Steel Pipe Standard Weight Internal Area 0.86 Sq. In. Pounds per hour	Extra Heavy Weight Internal Area 0.71 Sq. In. Pounds per hour
2 in. in 10 ft.	18.5	15.0
1½ in. in 10 ft.	17.0	13.9
1 in. in 10 ft.	15.0	12.0
½ in. in 10 ft.	11.8	9.2

TESTS WITH GLASS PIPES

Tests have recently been made at the Webster Research Laboratory with glass pipes 10 ft. long, set at various grades, the steam pressure being maintained constant at 1 lb. gauge. Results obtained in steam flow in pounds per hour when entering the critical state are given in Table 1.

Tests were also conducted using ¾-in. extra-heavy steel pipe and 1-in. standard-weight steel pipe under the same conditions of pressure, length of pipe and grade as with the glass pipe. Based upon the results obtained, values have been calculated for ¾-in. standard-weight pipes and 1-in. extra-heavy pipes. The test results and the calculated values are given in Table 2. While these latter figures are approximations instead of being actual test results, they are believed to be reasonably accurate.

In practice the capacities of horizontal supply run-outs, where the counter-flowing water is the result of condensation taking place only within the pipe, should be limited to values *less* than these quantities and additional allowance should be made for longer or exposed run-outs. There should be still further limitations on the ends of vertical risers where entrained water is likely to be swept up the riser and into the horizontal run-out.

Correspondence

Replacement of Underground Heating Lines

EDITOR HEATING AND VENTILATING MAGAZINE:

We have just replaced some 1600 ft. of underground steam and return line the condition and construction of which, as compared to the new, may be interest to your readers.

The old line consisted of 12-in. and 10-in. steam and 2-in., 2½-in. and 6-in. return. The return was genuine wrought-iron pipe and in general was in excellent physical condition, so far as the pipe was concerned. In fact, it was practically as good as the day it was put down except in a few places where the exterior was corroded and pitted, due to contact with ground water.

All of the return which was in good condition was reinstalled after cutting out the couplings and joining up the lengths by oxy-acetylene welding.

The steam lines were not quite so well preserved on the exterior as they had apparently been subjected to more vapor and ground water and were coated with a thin layer of oxide. However, in general they were not pitted and had retained their original thickness. The threaded joints were inclined to leak in places.

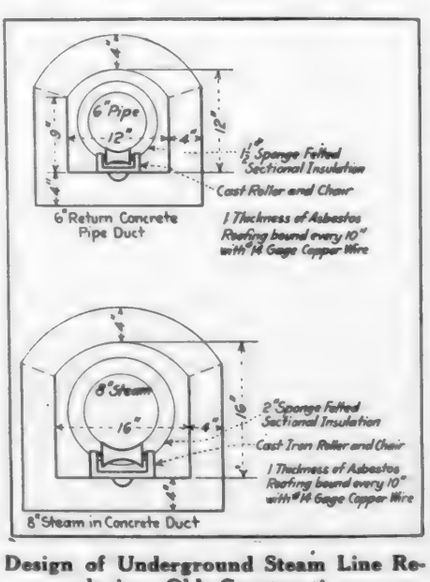
The lines removed were installed in cinder concrete ducts the walls of which were from 4 in. to 5 in. thick. The top of the duct was cast in place over a thin sheet-metal form. About every 2 ft. a sheet-metal separator was set up so as to form a parting in the cover. The separators did not come to the outside surface. The covers were easily removable as they separated at the partings.

The pipes were supported by short sections of pipe resting on the bottom of the ducts, forming rollers. In many cases we found these rollers destroyed by corrosion and in some cases they had worked around until they no longer supported the line.

The lines were insulated with sectional magnesia covering secured with the usual metal bands. This method of securing the covering was the weak point in the installation. These bands corroded off and a large portion of the covering had separated from the lines and accumulated on the bottom of the duct.

CONSTRUCTION OF NEW STEAM LINE

The new steam line is 8 in. full standard weight mild steel double random lengths, with beveled ends. All joints were welded. All branches were welded in, thus avoiding mechanical joints in so far as it was practical. Wherever joints were necessary the Vanstone square-cornered type was used. All wedges for adjusting alinement were avoided by heating the pipe with the torch and bending it, or, in the case of too great an angle, by a weld made at the angle.



Design of Underground Steam Line Replacing Old Construction.

Where practical, expansion joints and anchors at branches were avoided by allowing the branch sufficient freedom of motion to care for the strain imposed in them due to the expansion of the main line.

The expansion joints and anchors were secured to the 12-in. channels which spanned the manholes with the ends imbedded in the side walls of same. In no case does the channel span more than 7 ft. Our past experience with anchors and expansion joints secured to concrete pedestals has been very unsatisfactory.

All steam valves are operated from the surface by means of a wrench fitting a nut on the extension stem of the valve. The tops of the manholes are formed of ¼-in. thick steel plate supported on steel beams spaced 20-in. centers or less. This allows the easy removal of the top in case of trouble by the removal of the 9 in. to 18 in. of earth above the plate. The bottoms of the manholes in every case are on a level of the lowest underdrain of the out-going line. All the underdrains terminate in the manholes so that they are easily flushed out in case they become clogged.

Where the new line followed the line of the old one we used the existing concrete ducts supporting the pipes on cast-iron rollers which rest in cast-iron chairs secured to the bottom of the ducts by lag screws set in fresh cement mortar poured in the holes drilled for same. This construction centers the pipe in the duct.

The insulation in the ducts, as well as the manholes, consists of 2 in. thick sponge felt sectional covering for the steam lines and 1½-in. thick covering for the returns, secured to the pipe with 14 gage copper wire. This in turn is covered with high-grade roofing which is also bound on with copper wire. Where the new lines follows a new course it is installed in the well-known split tile in which the insulation consists of loose sponge filler.

The new line is built to carry a steam pressure of 200 lbs. It was tested under 300 lbs. hydrostatic pressure, the welds being vigorously hammered when under this pressure test. Under the above test the line was found perfectly tight.

HARRY A. WARD

Ithaca, N. Y.

A suggestion of value to heating, ventilating and allied trades in New York and other large centers is contained in the recent conference for training plumbing instructors, held in Pittsburgh recently under the auspices of the National Trade Extension Bureau. The conference continued for two weeks at the Carnegie Institute of Technology and the University of Pittsburgh. The instruction was planned especially for those engaged in the plumbing trade and the problems covered were those which have to be solved in the actual operation of plumbing schools.

American Society of Heating and Ventilating Engineers

Illinois Chapter Holds Experience Meeting in Oil Burning

SOME of the troubles experienced by heating men in burning oil for house-heating were related at the February meeting of the Illinois Chapter, held March 9, at the Chicago Engineers Club, Chicago. Many oil-burner men were among those present, and heard some very frank expressions of opinion as to the shortcomings frequently experienced with various types of burners, and what is needed to make them function more satisfactorily.

One of the principal suggestions made was for greater co-ordination between the oil burner people and heating men. Methods of control also came in for some lively comments, and the point was made that in a water heating system, for instance, the complete shutting off and turning on of the burner does not result in the satisfactory operation of such a system.

The meeting was one of the largest in the history of the chapter, there being 198 members and guests in attendance. Included in the guests was a delegation from the Chicago Heating and Piping Contractors Association, and numerous oil-burner manufacturers' representatives and distributors.

Before taking up the subject of the evening the new Chicago ventilation ordinance and the conflicting interpretations of the ordinance by the Chicago city officials were discussed. A letter was read from the Chicago Association of Civil Engineers referring to a resolution adopted by that organization urging the heating engineers to strive for a uniform ordinance and its consistent interpretation. The civil engineers tendered their full co-operation to this end. John Small urged that the chapter make an effort to have the Chicago ordinance revised to include excerpts from the ventilation section of the proposed A.S.H. & V.E. Code and also the Hill Synthetic Chart. It was voted to appoint a committee to secure the co-operation of the various organizations interested, including the Illinois Society of Architects and the Chicago Real Estate Board, with a view of securing a revision of the Chicago Ventilation Code.

President Linn then turned the meeting over to E. P. Heckel, chairman of the evening. Mr. Heckel called upon President Linn to open the discussion. Mr. Linn responded by quoting at length from an address by President O. P. Kenney of the National Petroleum Institute on "The Place of Furnace Oil in the Petroleum Industry."

Mr. Heckel then called on a number of those present to relate their experiences with oil burning. Those who participated in the discussion included H. M. Hart, T. Monahan, T. Douglas, Sam Haas and Messrs. Howard, Blanding, Colby, McDonnell, McGregor, Johansen, Mertz, Jones, Mitchell, Tomlinson, Hornung, McDargh, Lippe, Murphy and Samuel Lewis.

Mr. Hart stated that from his observation, the cause of most of the complaints on oil burners in residence heating was due to two things: first, the method of control; second, the size of the oil burner.

"In most cases," stated Mr. Hart, "oil burners have been installed too large for the purpose intended. This is probably due to the fact that most of the oil burners are sold direct to the owners through salesmen who are not heating engineers. Their practice seems to be to visit the premises and make a record of the size of the boiler; then they refer to the manufacturer's catalog to get the rating on the boiler and select an oil burner of sufficient capacity to develop the boiler's rating. Any one familiar with the present method of rating heating boilers knows that the manufacturer's rating means nothing at this time. The result is that the oil burners are usually 100% too large for the purpose intended.

"In reference to the control in connection with the vapor system. My observation has been that due to the fact that the oil burners are over-capacity and are usually controlled by means of a thermostat located on the first floor, generally quite near the boiler, uniform heating of the house is almost impossible. A vapor system is designed to be controlled by the valves on the radiators, it being the intention to carry a uniform pressure on the boiler at all times so that when a valve in any part of the house is partially or fully opened a uniform flow of steam will result. With oil burners controlled by a single thermostat, the room in which the thermostat is located, being close to the boiler, usually warms up quickly and then the thermostat shuts off the oil burner entirely, which does not come on again until this room cools. In the sleeping rooms, the radiators are shut off at night, while in the living rooms where the thermostat is located the radiator is left on all night. Therefore, steam is seldom carried long enough in the morning to warm up the sleeping rooms and the rooms at the far end of the system.

"The same thing happens with hot water heat. I have seen the temperatures vary on the boiler from 80° to 190° where the oil burner was controlled by a single thermostat placed in one of the living rooms near the boiler. The oil burner, being over-capacity, quickly raises the temperature of the water to the maximum; this is controlled by a limiting device at approximately 190°. The room in which the thermostat is located warms up first, as it does with a vapor system. The thermostat then shuts off the oil burner before the balance of the house is properly heated and before the water has assumed its proper circulation.

"These remarks, of course, are applicable to large residences of from twenty-five to thirty rooms; I have had no experience with oil burners in bungalows or very small houses.

"My idea is that the control on a vapor system when burning oil should be similar to that when burning coal. In other words, it should be designed to carry uniform pressure. The control on a hot water system should be by means of an aquastat, in addition to the room thermostat. The aquastat should have a range of from 20° to 30° from maximum to minimum temperature and should be easily adjustable to meet outside weather conditions.

"The result of such control would be that in average winter weather the aquastat could be shut off at a maximum of 160° and a minimum temperature of 130°. Thus uniform circulation would be maintained throughout the entire system at all times. It would be found that this aquastat would not have to be changed more than two or three times during an entire heating season and the system could be operated in the manner for which it was designed, provided the oil burner was properly proportioned to the heating requirements."

Mr. Monahan expressed the opinion that one of the chief troubles with oil burning is due to the fact that the boiler is designed for coal and not for oil. The oil burner man, he said, talks of burner efficiency, but the boiler may easily change this efficiency. Mr. Douglas also referred to the difficulties of controlling the oil burner in connection with a vapor heating system. The greatest percentage of service calls, he said, are due to the control apparatus or to improper operation. Mr. Blanding expressed the belief that satisfactory control may be secured through the control of the oil and air mixture. Too many $75,000 jobs, he stated, are equipped with $75 thermostats. Mr. Blanding urged continuous burning with the heat supply control at the radiators and likened a good many installations to

Ford tops on Pierce Arrow cars. He expressed opinion that individual control on vapor and vacuum jobs is necessary.

Mr. Monahan cited cases where the water left the boiler with disastrous results due in part, at least, to the variance in boiler ratings. He urged the closest co-operation between the oil burner and heating men. Mr. McDonnell recommended automatic means for keeping the proper amount of water in the boiler with an oil-burning system. In this connection Mr. Hart expressed the opinion that the average burner selected for a given installation is too large. Often the burner is on for one hour, and then off the rest of the day, creating an over-load for short periods. He believes small burners would cut down surgings. Another point brought out was that if the water is clean it will stay in the boiler. Mr. Johansen announced that he was manufacturing a semi-water-tube type boiler with two combustion chambers, one for oil, and one for coal.

In reply to those who advocated continuous burners instead of flash burners others advocated intermittent burners, one speaker stating that he had installed 56 intermittent burners and had found them to operate satisfactorily.

Samuel Lewis expressed the opinion that a double type of boiler designed to burn oil at the back, with grates in position, permitting the use of oil and coal, might be the best solution of the problem, or two boilers could be installed, one for oil and one for coal.

Lack of uniformity in the oil supply was also mentioned. Mr. Hornung related the satisfactory results he had secured in his own home with a nozzle-type of burner as described in THE HEATING AND VENTILATING MAGAZINE for September, 1924. He expressed the opinion that the oil burner industry must learn more about heating, and that this is the secret to its greater progress. President Linn doubted if a boiler especially designed for oil burning is necessary. He found from his tests that the greatest efficiency is obtained in a boiler with a long horizontal flue.

Mr. Lippe urged the use of two or more burners in a system operating as a unit with the idea of having one or more burners in use at a time as needed. He stated that an unbalanced ot water job will not work with an oil burner, and that the piping should be arranged to prevent short circuiting. Mr. Murphy stated that when he first entered the oil burner business he advocated the continuous type of burner, but that later he was literally forced by demand into the automatic-control type. He said that more often the thermostat is not the cause of the trouble but improper variance in the flashing of the oil.

President Linn appointed Carl Johnson as chairman of the Committee of Arrangements for the May meeting of the chapter which will close the season and be purely a social affair.

Conditions and Practices in the Heating and Ventilating Industry Come Up for Frank Discussion

MEMBERS of the heating and ventilating industry got down to "brass tacks" at the March meeting of the New York Chapter in New York, March 23, when they took up the discussion of "Heating and Ventilating Engineers and Their Human Relations." Actual conditions in the industry, which more than one speaker characterized as deplorable, were discussed in detail and held the close attention of those present.

Perry West, who conceived the idea of the meeting, acted as chairman. His array as speakers included Albert M. Baum of Jaros & Baum, consulting engineers, New York City; Homer Addams, of the Kewanee Boiler Company; J. D. Heery, of the heating contracting firm of Jaehnig & Peoples, Newark, N. J.; W. O. Ludlow, of Ludlow & Peabody, architects, New York; A. C. Holden, chairman of the Small House Department of the American Institute of Architects; Lewis E. Kern, technical secretary of the Scientific Research Department of the American Institute of Architects; and J. I. Lyle, of the Carrier Engineering Corporation.

CO-OPERATIVE BUREAU SUGGESTED TO IMPROVE CONDITIONS

Mr. West, in introducing the subject, stated that it was the object of the meeting to bring together representatives of the various branches of this field of engineering for a friendly discussion of some of the unsatisfactory features of the present status of the planning, specifying and installing of heating and ventilating equipment in buildings and the devising of a plan, if possible, to inaugurate some kind of a co-operative bureau or agency for guiding, directing or controlling the better handling of this branch of the science.

As he stated, we have the National Board of Fire Underwriters' rules and regulations for controlling the installation of electrical equipment and the plumbing codes for the installation of plumbing work, but practically nothing for guiding or controlling the proper installation of heating and ventilating.

Two great controlling motives, of course, have operated to bring these accomplishments about, one being the protection of life and limb and the other the protection of property both primarily against fire hazards and epidemics.

Mr. West pointed out that in a great many of our modern buildings the heating and ventilating and hot water supply equipment is sadly deficient, principally due to the fact that it is not properly planned, specified and installed. He spoke of the way these matters are being handled in such cities as Chicago, St. Louis and Brooklyn by engineering bureaus maintained by contractors and labor unions through which prospective plans and specifications must be passed and approval obtained before the mechanics or contractors will submit figures or attempt their installation. This practice has been given the name of "certified heating."

WHY MANUFACTURERS ARE NOT QUALIFIED TO PREPARE PLANS

Mr. West introduced Albert M. Baum as the first speaker. Mr. Baum dwelt on the improper preparation of plans and specifications which every engineer finds. He attributed this particularly to the practice on the part of some manufacturers of furnishing plans, and expressed the opinion that as a rule manufacturers do not maintain an engineering force, and furthermore have no time to study room arrangements and similar details. The practice, he felt, was bound to result in dissatisfaction between the architect, engineer, contractor and owner.

The consulting engineer, he said, always gets blamed if the job does not work, and he urged better co-operation between the engineers and architects to secure complete plans and specifications by skilled men.

PREPARATIONS OF PLANS AND SPECIFICATIONS SHOULD ALWAYS BE PAID FOR

If contractors lay out work they should be paid extra for it and this, he said, also applies to plans made by manufacturers. No one he declared, can afford to render such service gratis. He proposed a central organization to check plans and specifications. With such a bureau heating contractors would be within their rights if they refused to go ahead with an installation until it had the approval of the central bureau.

SALESMEN ANXIOUS TO SELL THE BEST

Homer Addams, who was asked to speak from the salesmen's viewpoint, declared that every salesman wants to sell the highest quality apparatus. He felt that the salesmen were in need of more encouragement from the other interests involved. Not enough distinction, he said is made between good and poor apparatus, and he cited a number of homely illustrations to show that the cost is not such an important factor if the user finds satisfaction in his equipment. That, he said, is the important point.

LARGE AMOUNT OF HEATING WORK NOT LAID OUT

J. D. Heery, speaking from the contractors' standpoint, declared that in

his own business 75% of the heating work carried out by his company is not laid out, in the proper sense of the word. He felt the contractors have no right to lay out heating and ventilating work and yet, as a matter of fact, they are obliged often to remedy the jobs which the so-called engineering contractors design. He spoke of the great amount of heating work being done by plumbers which further affected the quality of the installations. He was opposed, he said, to manufacturers laying out heating work, and declared that they have plenty to do to improve their product. He urged more quality rather than quantity, and expressed the need for a bureau for the heating industry, similar to the National Trade Extension Bureau for the plumbing industry. It was important, however, to keep such a bureau out of politics. As a preliminary step he urged the interested organizations to make a survey of conditions throughout the country on the points he mentioned.

MANY INSTALLATIONS CONTAIN TOO MUCH APPARATUS

W. O. Ludlow told the members what he would do if he were a heating engineer, and acknowledged at the outset how natural it was for people to like to do business with the men they like. He felt that many installations contain too much apparatus for the man in charge to handle, and he thought the heating engineer should not hesitate to tell the architect when such is the case. He urged the engineers to work along the same lines as the architect and to read the architectural magazines so as to get the architectural point of view. He would stick to the janitor or operating engineer until the latter learned how to handle the plant being installed. Finally he would get closer to the owners to show them what the apparatus was designed to accomplish and felt that architects should not stand in the way. The last three weeks he declared, are the most important in the relations of an engineer to an architect. He urged the chapter to join the New York Building Congress. His message, he declared, could be summed up in the one word, "comradeship."

PROVIDING EQUIPMENT DATA FOR THE SMALL HOUSE BUILDER

A. C. Holden gave an interesting account of the efforts of the American Institute of Architects to educate the owner of smaller types of homes in what was needed in the way of equipment. He explained the plan of the institute whereby equipment for given types of houses is being standardized. It would be quite impossible, he said, for the average home builder to employ the necessary talent to properly design his house, but by following the institution's method he can secure the information for a given type of house and then adapt it to his own. He felt that the industry must help the owner to understand what is involved in the plans and specifications. Through the method being followed by the Institute the owner can classify his wants and be given the information he needs on the fundamentals of home equipment, including knowledge of the different types of heating systems. There could be special Bureau members, he said, among heating and ventilating engineers. He summed up his talk with suggestions that, first, the members should co-operate with the Institution's Small House Service Bureau; second, they should co-operate with the Institute in drawing up information sheets; and, third, should furnish the Institute with names of correspondent members who could be called upon for critical advice.

HEATING INDUSTRY MUST EDUCATE THE PUBLIC

Leroy E. Kern endorsed the remarks of the previous speaker in urging that the heating and ventilating industry should start to educate the common people on the subject. "You will have to do it yourselves," he declared, "and it is something that will affect not only the engineers or architects, but the whole building industry." If such a plan is followed out, he said, we will develop a real building industry, instead of a group proposition, as it is at present.

J. I. Lyle referred to the fact that the propositions which had been outlined has originated from the same "dreamer" who had originated the idea of the society's research bureau—Perry West. This remark brought a burst of applause for Mr. West. For that reason, added Mr. Lyle he felt it to be more than likely that something had been "started" which might have important consequences.

DISADVANTAGES OF BUREAU IDEA

Mr. Lyle told how both the fan and boiler manufacturers used to make plans and specifications. The fact that it is not done now to any extent, he said, is an indication of the progress the industry has made. The present-day contractor, he declared, knows more engineering than the average engineer knew in the old days. He felt the practice of "certified heating" was apt to lead to price-fixing, and felt that it would be unwise for the consulting engineer to proceed along that line. Other speakers who felt that the bureau idea would hardly work out in practice were H. G. Issertell, Thornton Lewis, George B. Nichols and F. R. Still.

COMMITTEE APPOINTED TO STUDY PROBLEM

Mr. Nichols spoke of the fact that 80% of the work now being done in New York comes from the office of the younger architects, and it is being carried out at such a low percentage that there is often little left for the engineer.

The meeting closed with the appointment of a committee, suggested by Mr. Still, to survey the problem in view of the discussions and to map out a plan of action. Perry West was appointed chairman of this committee with authority to select the other members.

Arthur Ritter was appointed chairman of a nominating committee to select officers for the coming year. Charles V. Haynes, speaking for the council of the society, asked for an expression of the sentiment of the members on holding the society's coming summer meeting in Atlantic City. A majority of the members was recorded as favoring Atlantic City.

President Dibble Guest of Philadelphia Chapter

Activities of the A.S.H. & V.E. and effect on individual members was the subject for discussion at the March meeting of the Philadelphia chapter, held March 12 at the Engineers' Club in Philadelphia. The new president, Samuel E. Dibble, was the guest of honor. Professor Dibble addressed the meeting, speaking particularly of the achievements of the society's Research Laboratory, and urged the support of the work by all of the members.

D. Knickerbacker Boyd gave an account of the recent hearing in Columbus, O., in connection with the proposal to change the Ohio building code to provide for a lowering of the ventilation requirements from 30 cu. ft. to 10 cu. ft. of air per minute per pupil in schools. This lowering of the standard was proposed by the Board of Building Standards of Ohio. Mr. Boyd told of the heated discussion of the proposed change and informed the meeting that no final account was taken, the matter being held in abeyance for the present.

It was announced that the April meeting would be devoted to a discussion on pumps, and the May meeting to school house heating.

Milwaukee Chapter Members Guests of Bayley Mfg. Company

The Bayley Manufacturing Company, of Milwaukee, was the host of the Milwaukee Chapter at its March meeting. The members met at the plant of the Bayley company where dinner was served, followed by inspection of the plant. The company had also arranged an exhibit showing its different products in operation.

President Frank Downey expressed the sentiment of the members in stating that meetings of this kind were bound to prove of much benefit to all. It was announced that the April meeting would be held at the plant of the Johnson Service Company.

Western New York Chapter's March Meeting

Cartridge copper heaters and district heating were the principal sub-

jects for discussion at the March meeting of the Western New York Chapter held in Buffalo, March 2. The speakers included L. George Bousquet, chief engineer of the U.S. Cartridge Company's Research Department, who illustrated his talk with lantern slides; C. Gottwald of the Ric-Wil Company, Cleveland, who spoke on "Co-Operative Central Heating for Residential Districts"; and Walter J. Kline, contract sales engineer for the American District Steam Company, No. Tonawanda, N. Y., whose subject was "District Steam Heating." A general discussion followed the presentation of the papers.

Heating Engineers to Meet in Atlantic City

Announcement is made that the forthcoming summer meeting of the American Society of Heating and Ventilating Engineers will be held in Atlantic City, N. J. The dates selected are Monday, Tuesday and Wednesday, June 15, 16 and 17.

Legal Decisions

Change of Heating System Installed—Acquiescence of Owner—Conclusiveness of Architect's Decision

In a suit to foreclose a mechanic's lien for installing a heating and plumbing system in a theatre and two stores belonging to defendant, the defense was that the plaintiff had not complied with his contract in installing the heating plant and had installed a wholly different system from that provided in the contract.

The contract provided that the architects should have general supervision and direction of the work and should "make decisions on all claims of the owner or contractor and on all other matters relating to the decision and progress of the work or the interpretation of the contract documents."

According to plaintiff's evidence, the overhead heating system was specified in the contract because the architect was informed that the basement of the building in which the boiler was to be located would not have sufficient drainage to adopt the up-feed system.

Soon after the work was started, the contractor's representative found that the basement was deeper than the profile showed, and that he could put in the up-feed system. The architect was there and his attention was called to the matter. He immediately instructed the contractor to install the up-feed system. After it had been installed the owner accepted it as sufficient to heat the buildings, but afterwards refused to pay on the ground that the change was a material one, and the up-feed system was not so adapted to heat the building as the one he had contracted for.

Four witnesses for the plaintiff, including the firm of architects and the plaintiff's superintendent and his foreman, testified that the up-feed system was more efficient for heating this character of building than the overhead system. It was cheaper and the contractor had agreed to deduct proportionately the amount provided under his contract. They testified that the change of systems was not a material change.

On the other hand, two experts for the defendant testified that the change was a material one, and that the overhead system was better than the up-feed system.

The Chancellor was of the opinion that the change was a material one and that therefore the plaintiff was not entitled to recover.

On appeal the Supreme Court of Arkansas holds, Pettit-Galloway Co. v. Womack, 268 S. W. 353, that it was unnecessary to decide whether or not the change was a material one, being of opinion that the doctrine of equitable estoppel applied and that the defendant had waived the right to have the overhead system installed; that is, to say, the general doctrine applied that if one maintains silence when in conscience he ought to speak, equity will debar him from speaking when in conscience he ought to remain silent. To constitute silence an estoppel, there must be both the opportunity and the duty to speak and the action of the person asserting the estoppel must be the natural result of the silence; and the party maintaining silence must be in a position to know that someone is relying thereon to his detriment.

Under the evidence as stated above, the court holds that the principle of equity and natural justice above stated decided against the defendant. Under the circumstances detailed it was held fairly inferable that he knew that the change from the overhead to the up-feed system was due to the instructions given by his own architect. If he proposed to dispute the architect's right to change the plans good faith required that he should have done so before the plaintiff went to the trouble and expense of installing the up-feed system.

The evidence showed that the plaintiff acted in perfect good faith in the matter and in reliance upon the instructions given its agent by the defendant's architect. After allowing the plaintiff to install the changed system without objection on his part, the defendant it was held, must be presumed to have consented to the change, and the doctrine of equitable estoppel applied to the case.

On the question whether the up-feed system was properly installed the evidence was in direct and irreconcilable conflict. On the plaintiff's part it was shown by the architect and the plaintiff's superintendent and foreman, that the work was done in an efficient manner, without defect, except as to one minor leak, which plaintiff offered to repair. On the other hand, it was shown by the defendant that the system was not properly installed; the witnesses on either side giving their reasons for their testimony.

The court did not find it necessary to decide upon the weight of the testimony. The contract provided that the architect should have general supervision and direction of the work; and it was performed according to the architect's instructions and approved by him. It was also fairly inferable that the defendant was present during all the time the heating plant was being installed.

The architect's decision was held to be conclusive that the work was done according to the specifications, and there was nothing in the record to show that his decision was the result of gross mistake or the failure to exercise an honest judgment in the matter.

The decree of the court below was therefore reversed, and decree ordered for the plaintiff.

Increase in Electric Heating Rates Permitted

Objection to an increase in an electric heating rate in a proposed new schedule of the California-Oregon Power Company, was made by letter to the Oregon Public Service Commission by certain consumers found to be using electric service for house heating. The commission was of opinion that electric service may be only rendered for heating in instances where its convenience justifies the reasonable cost thereof, and that "the rate-payers as a whole, upon whom the cost of utility service must ultimately rest, cannot afford to carry the burden of ordinary heating at rates which would be satisfactory to the heating consumers."

Mr. Worden of the National Radiator Co., is reported as authority for the statement that an apparatus recently patented in Europe is so delicate as to be affected by the warmth of a woman's cheek a quarter of a mile away and by the heat of a candle flame four miles away.

THE STATE OF BUSINESS

Market in Watchful Mood

First High Point Reached in Economic Upward Movement—Purchasing Strength Increasing

Especially Prepared for the THE HEATING AND VENTILATING MAGAZINE

By *L. W. Alwyn Schmidt*

THE sharp upward movement of the economic curve of the last few months is experiencing apparently its first check and the slight drop noticed in some of the key industries has led to a temporary stop in the expansion of the commodity markets. This development will not be a surprise to those who have studied the recent history of the national markets. It finds its explanation in the desire of the market to take stock of the achievements of the first two months of the year with a view to take better care of future opportunities.

The recent buying activity has followed a period of depression. It has in many instances taken the form of a political demonstration. This is not a very sound foundation to build upon and manufacturers and dealers, after having learned their lesson during the last years, must be excused, therefore, if they are unduly careful in their production and merchandizing policies. They simply do not want to be caught again by a sudden drop in the purchasing activities of the market.

As it is, the situation is not entirely free from disquieting elements.

An outstanding feature of the situation is an almost unseasonable surplus of activity in one set of industries, while others remain either stationary or even start to recede.

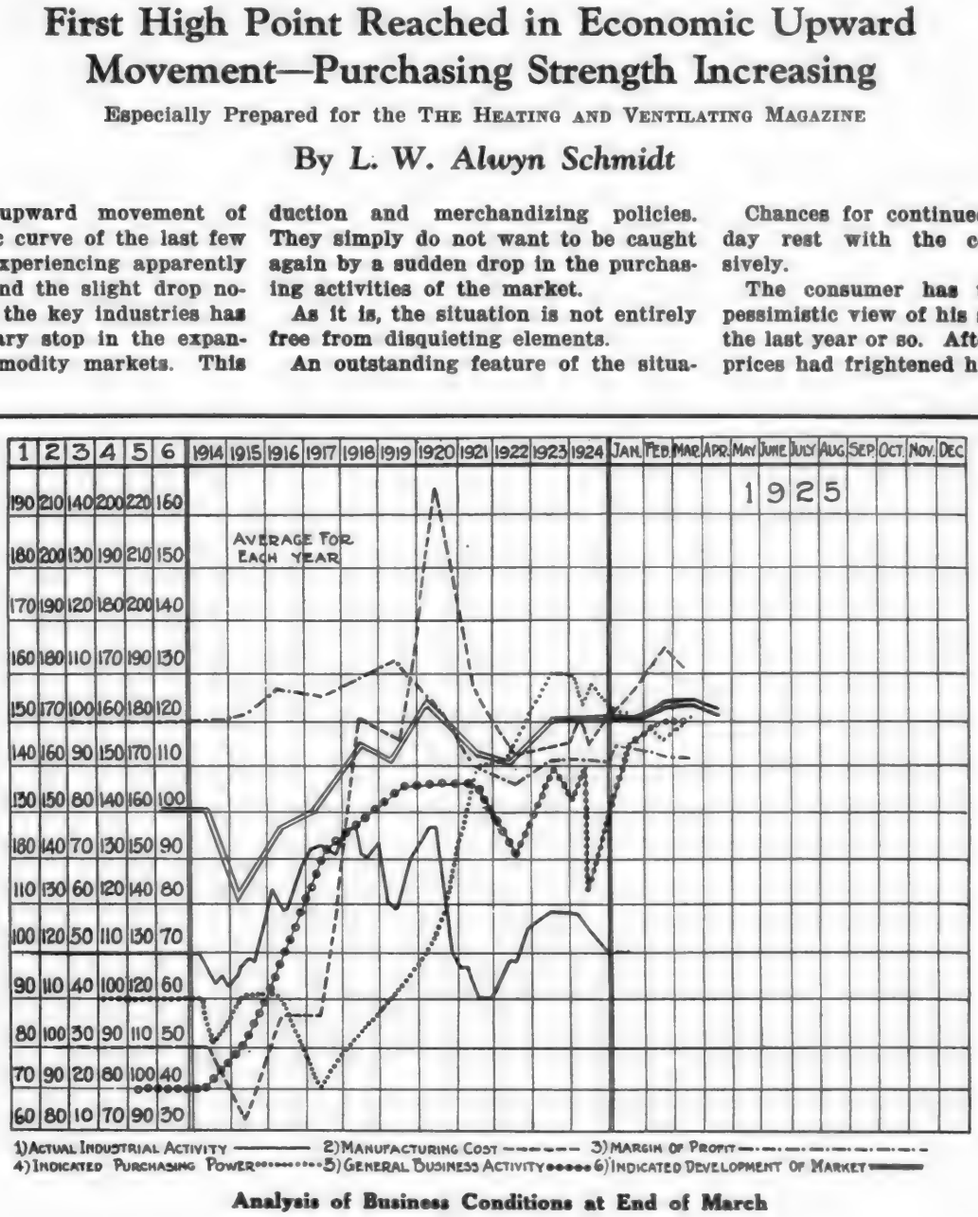
The mail-order houses whose business is thought to be a good indicator for retail activity are reporting very good business from the West, but western experts point out that the increase in retail buying is by no means sensational and, in fact, is running along conservative lines.

It seems, therefore, that the actual improvement of the market is still very much regional in character and has not touched evenly all branches of the national industry.

Chances for continued prosperity today rest with the consumer exclusively.

The consumer has taken a rather pessimistic view of his situation during the last year or so. After a run of high prices had frightened him, so to speak, out of the market, he is coming back very cautiously only, and shows little inclination to swallow the bait of lower prices offered by the manufacturers and retailers. But prices have taken a decided downward turn during the last half year. This does not apply so much to food prices, but there has been a marked reduction in all other consumers' merchandise. The present tendency is to provide better quality for lower cost. Good results will be derived from this in the near future.

But experience has shown that even low prices are not always a cure for a commercial deadlock unless the consumer is able to make use of his op-



Analysis of Business Conditions at End of March

portunity. It is, therefore, the consumers' financial condition which offers the solution for our present economic problem.

The purchasing strength of the consumer cannot be easily measured. The two main factors envolved are the actual earning power of the wage earner, the salaried and business man, pitted against the cost of living. The first constitutes the accumulated spending force of the nation, the other the absolutely necessary expenditure for the upkeep of life and home. What is left after the latter has been satisfied may be expected to be spent for luxuries and surplus of comfort. If earnings are high and living expenditures normal the margin increases. It is decreased by rising food prices, high rents and by high prices all round. If the margin left to the consumer after satisfying his necessary and normal wants is large, one may expect that part of the surplus will be spent in additional, not immediate, needed purchases. To apply this rule to the present economic situation, it will work approximately as follows:

In view of the larger activity in the nation's industries we can expect more employment during the coming months, with increasing wage scales and better earning all around.

This, together with the increasing steadiness of the political situation at home and broad, gives hope for a widening of the buying movement late in Spring or during early Summer. Time, therefore, will be given to individual industrial branches to get ready for an increasing demand for merchandise. Manufacturers will do well to move cautiously, adding to their productive facilities only when compelled.

An attempt should be made to place stocks in the hands of the jobbing and wholesale trade, so as to permit a regular flow of merchandise from producer to consumer without over-taxing the existing industrial equipment. Retailers may aid by making an exact survey now of their respective markets with a view of regulating their purchases sufficiently far ahead to avoid rush-orders when business gets fully under way.

Tests Showing Efficiency of Higgin Metal Insert Strip

In spite of the prior issuance of nearly 900 patents in the weather strip field, the practical development of the art of keeping excess and unwanted cold air from the home has led to the design of a type known as the Higgin all-metal strip. It is manufactured by the Higgin Mfg. Co., Newport, Ky.

The Higgin equipment for a window of the regular sliding type consists of two strips, one usually made of zinc, which is attached to the window frame, with a tongue or raised portion which forms a track on which the sash slides. The other strip called the insert, is made of light spring bronze, and is inserted in a groove in the sash. The spring flanges of the insert lightly contact with the tongue of the track to seal the aperture.

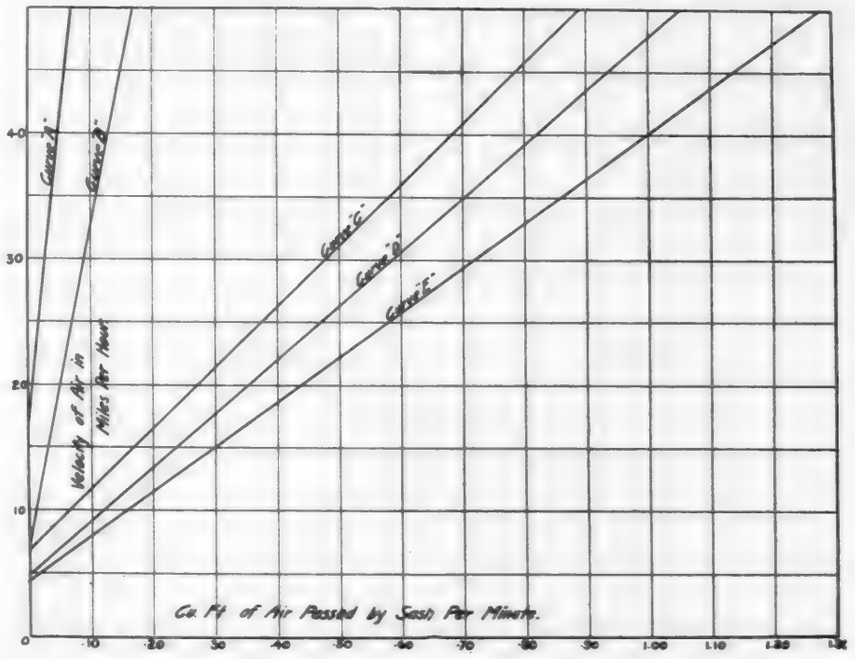
Recent tests of this strip as a preventative of cold air passing a wooden window have been made, to show their value to the home owner. The tests were made by George Hornung and Son, using a blower, an air receiver, and a double coniform housing, at the base of which the window frame under test was set. The necessary draft gauges, anemometer, pitometer, barometer and thermometer were used. The air from the blower was passed to the receiver, and through a 4-in. valve to the apex of an air-tight cone. At the base of the cone the window was placed, from the opposite side of which a second cone extended.

Five tests were made with a typical window, in three of which the window clearance was set at 1/32 in., 1/16 in. and 3/32 in., respectively, with no weather strips. In the fourth test, with 3/32 in. clearance, a metal track strip was added, and in the last test, with conditions as for the fourth, the insert strip was applied.

The curves plotted from the data obtained indicate the ability of the Higgin equipment to prevent material passage of air around the window frame even with pressures greatly in excess of those obtaining in a gale of wind. It is interesting to note that the amount of air passed with pressures corresponding to wind at 60 miles an hour is not materially increased when twice the pressure is applied.

A table accompanying the curves shows that when the wind is blowing 18.36 miles an hour the leakage around a sash 48 in. x 30in. with a clearance of 3-32 in. will be 35.62 cu. ft. of cold air per minute where no weather strip is used; 3.81 cu. ft. when the track strip alone is used; while the instrument is unable to detect any leakage when both the Higgin track and insert are used.

With the wind blowing 40.45 miles per hour the leakage without strips is 89.87 cu. ft. of cold air per minute; with the track strip alone the leakage is 12.04 cu. ft. per minute; while with the higgin track and insert strips the leakage is reduced to 4.87 cu. ft. per minute.



Air Leakage Under Different Pressures Around a Sash of a 48-in. x 30-in. Window, With and Without Metal Window Strips.

	Sash Clearance, In.	
Curve A	3/32	Track Strip with Higgin Insert
Curve B	3/32	Track Strip Alone
Curve C	3/32	Without Weather Strip
Curve D	1/16	Without Weather Strip
Curve E	1/32	Without Weather Strip

President Baker of Kewanee Boiler Company Presents $400,000 to Home City

A notable benefaction to the town of Kewanee, Ill., is announced in the gift to that city of income-producing property valued at $400,000, by E. E. Baker, president of the Kewanee Boiler Company. The annual returns from this amount, between $25,000 and $30,000, will be devoted to Kewanee's parks, crippled children's work and assistance to Kewanee boys in acquiring an education. A corporation has been formed to be known as Emerit E. Baker, Inc., which will administer the income from the $400,000 fund. The charter describes the scope and objects of the work as "to establish, build, improve and maintain parks, public grounds, public buildings, public baths and playgrounds

and contribute to the support of any of the foregoing described projects or institutions, to help and aid crippled children, to render financial aid to worthy young people seeking an education, to receive and accept gifts, bequests and devises." At a recent meeting of the Illinois Crippled Children's Society held in Chicago, Mr. Baker was elected president of the organization.

New Apparatus and Appliances

Minneapolis Recycling Motor Program Switch

A new development in motor control switches, especially designed for use with oil burners, has been brought out by the Minneapolis Heat Regulator Co., Minneapolis, Minn., and is fully described in a booklet just off the press.

This control is designed for use on a low-voltage circuit, using either room or boiler control, or a combination. Its particular desirability is with oil burners requiring a definitely timed and set program of operations in the starting and stopping of the burner. It can be furnished with either one or two electrical switches, each of 10 ampere capacity. These 110-volt switches, by means of specially-designed cams, can be made to close and open electrical circuits according to any required program. Auxiliary apparatus, such as gas and oil valves, can be controlled with any number of extended shafts up to three all equally timed and revolving at the same speed.

The program switch can be furnished with varying gear ratios, giving a range of operation periods to meet particular requirements from 30 seconds up to six minutes.

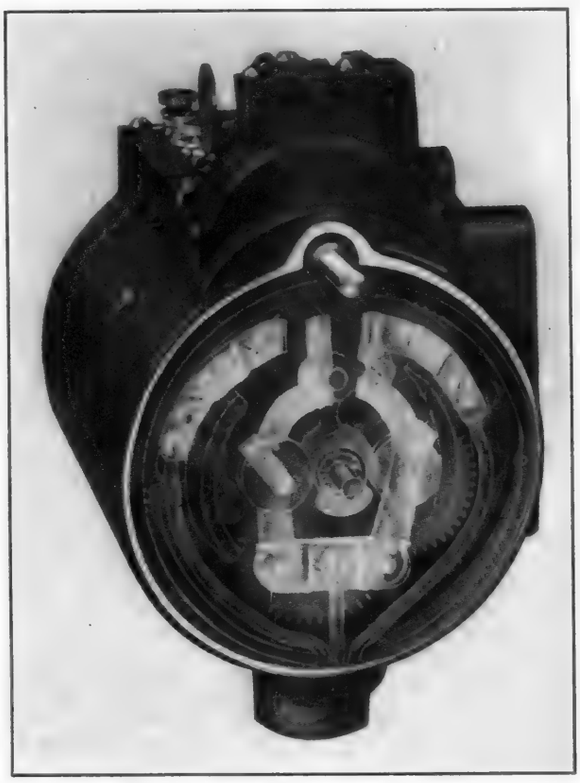
A new and important development is presented in the recycling model of the program switch, providing a means to completely recycle the switch after any interruption in the power circuit, reigniting the burner by putting the program switch through its complete ignition cycle. This new feature is of the utmost importance with burners utilizing expanding gas pilot flames or electric ignition.

As an example of the operation of the program switch, the following illustration, employing a switch designed to operate over an ignition cycle of 45 seconds is cited. At the start of its operation to ignite the burner, one of the 110-volt switches is closed within two or three seconds after the program switch starts to revolve, closing the circuit to the electrical ignition apparatus. Five seconds later, the second switch is closed, starting the blower motor. Thirty seconds after the start of the blower motor, the first switch is opened, cutting off the ignition apparatus, the program switch runs for an additional fifteen seconds, stopping at its normal "on" position, leaving the second switch closed and the blower motor running.

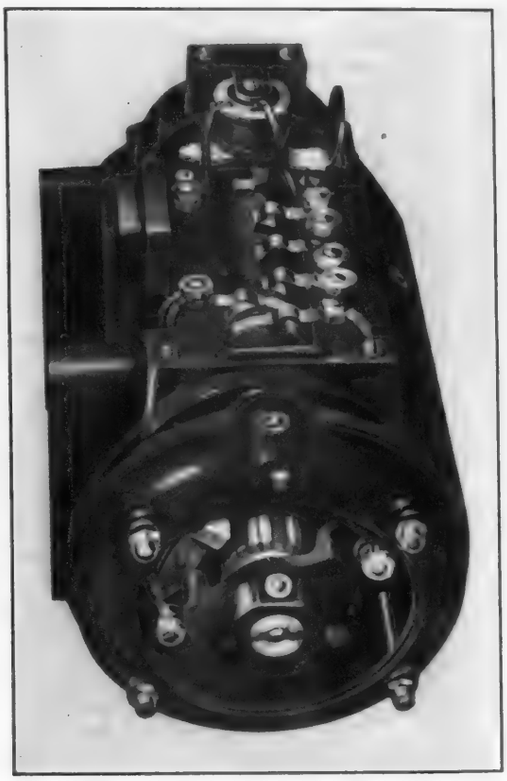
When the thermostat calls for shutting off the burner, the program switch again starts to revolve, breaking the circuit through the second switch and cutting off the burner. In the event of any interruption in the power circuit while the burner is operating, such as trouble at the power house, blown fuse, etc., as soon as current is resumed, the motor program switch immediately operates, cutting off the switch controlling the blower motor, and bringing the burner to its normal "stop" position. As the room thermostat will be calling for more heat, the program switch will continue through its normal starting cycle operating the ignition means, and leaving the burner in its normal running position.

The program switch motor is of the repulsion type with a permanently energized field, with the thermostat opening and closing a circuit across the brushes to control the motor. In this way a low-voltage circuit for the operation of the thermostats is secured without the use of separate current reducing devices.

No ground circuits, either high or low voltage, are carried on the program switch. Bakelite insulation is used throughout with heavy moulded bakelite plates carrying the switch mech-



Motor Switch Showing Switches



Motor Program Switch Showing Recycling Mechanism

anism and contact changing devices.

The motor program switch can be furnished with or without the recycling device, depending on the conditions under which it is to be used. This recycling device fulfills a long felt need in the control of oil burning equipment, and is an important safeguard on any oil burner which does not employ a constant ignition means. The recycler is very simple, adds no complications to the control, and is both mechanical and electrical in its operation. An armature is employed, dropping by gravity, on failure of electrical current. This shorts the closing circuit of the program switch so that on resumption of current, the program switch moves to the "off" position. When the program switch starts its opening action, a cam mechanically lifts this armature into the path of a small magnet, which is energized while the burner is in operation. The magnet holds the armature up, and the cam passes by. If any failure in the power circuit occurs, the magnet is immediately de-energized and the armature is dropped, shorting the closing circuit of the program switch. If the room thermostat is calling for more heat, the program switch will continue by the stopped position on to its normal running position, operating the ignition apparatus and insuring proper re-ignition of the burner. If thermostat is not calling for more heat, the program switch stays in the "off" position until an action at the thermostat restarts the burner.

The switches driven by the motor are simple in construction and exceptionally reliable. They are the quick break type operated by jump cams with spacing between the blades. The entire snap switch mechanism is mounted in moulded bakelite, two separate switches are provided which may be cammed to suit requirements. These switches are rated at 10 amperes capacity. One switch may be used to control the blower motor, the other to control the electric spark ignition, magnetic valves or other electrical apparatus on the burner. The timing of the switches may be quickly and easily changed by substituting different cams.

The program switch may be mounted either on the wall of the heater room or on the burner itself. When mounted on the burner, the switch without recycling device can be mounted in any horizontal position. With the recycling device, it can be mounted in only two positions.

No Lowering of Ohio Ventilation Standards

Late advices state that the movement to revise the Ohio State Building Code, lowering the ventilation requirements in public school buildings from 30 cu. ft. to 10 cu. ft. of air per minute per pupil, has been voted down by the State Assembly.

New Trade Publications

CRESCENT SYSTEM OF MODERN HEATING is the title of Catalog 6, issued by W. H. Pearce & Co., Chicago, Ill. The catalog is profusely illustrated and covers the Crescent line of ball-bearing pipe rests, conduit casing, expansion joints, condensation meters, steam traps, and other specialties pertaining to steam transmission. It is printed in loose-leaf style, with 34 pages, 6 x 9 in.

GEM FLUELESS BOILER is described in a folder of the Monarch Sales & Engineering Co., 1904 Olive Street, St. Louis, Mo. The folder contains tabulated specifications of boilers from 1½ H. P. to 30 H. P. rating, together with copies of testimonial letters corroborating the claims of fuel economy and quick steaming.

MINERAL SEAL-OIL HEAT EXCHANGERS are described in a folder issued by Griscom-Russell Co., New York, N. Y. They provide for the interchange of heat between saturated and unsaturated seal oil. Compact design and the use of counter-current flow of the oils are dominant features. All oil connections are placed at one end, simplifying piping and facilitating by-pass connections.

WATER HEATERS of the International Heater Co., Utica, N. Y., are listed, in its latest bulletin, in sizes from 100 gal. capacity to 700 gal. The bulletin contains valuable data on cost of heating water for domestic use and on the selection of the proper size for various family requirements.

PHILLIPS SELF-DRILL SHELLS, and the Phillips spring hammer drill are shown in folders issued by the Phillips Drill Co., Chicago, Ill. These self-drilling expansion shells are used for pipe hangers, etc., and consist of a tubular drill to which is attached such fittings as may be required to attach the load to be carried. The drill is a one-man machine, drilling holes in the ceiling through the action of a spring hammer actuated by a double handle, similar to that of a large breast drill. The drill is self-supporting and self-feeding, and will drill holes up to 2 in. in diameter.

Expansion Shell Used for Pipe Hanger

Phillips Spring Hammer Drill in Operation

TRANE TRAPS of the bellows type, for radiators, are described in Bulletin 6B, of the Trane Co., LaCrosse, Wis. ½ in. to 1 in. sizes are listed, in different patterns, the largest size being furnished with special tapping for ½ in. by-pass.

GORTON SINGLE-PIPE HEATING SYSTEM is outlined in a folder sent out by Gorton & Lidgerwood Co., 96 Liberty Street, New York. The folder describes the fittings which may be attached to an existing steam system to convert it into a Gorton system.

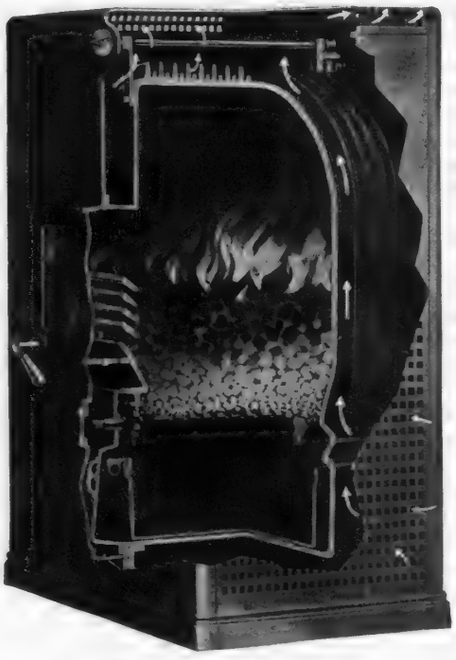
EXCELSO WATER HEATERS are shown in a bulletin of the Excelso Specialty Works, Inc., Buffalo, N. Y. Prices and data are given on six sizes, from 30 gal. to 250 gal. capacity. Heaters are supplied in either brass or iron.

FORGED STEEL PIPE FLANGES is an elaborate catalog prepared for distribution by the American Spiral Pipe Works, Chicago, Ill. Primarily a handbook of valuable information for engineers, designers and operators, this catalog lists various types of flanges based on A. S. P. W. standards, 125, 250, 400, 600 and 900 lbs. There is a comprehensive collection of formulae and tables, and the entire publication is illustrated with full-size cross sections and many half tones. Boiler

nozzles, welding necks, rivited pipe flange standards and boiler flanges are treated, and there is an interesting section on corrugated steel furnaces. Copies of the catalog will be mailed to those interested on request. Size 8½ x 11 in., 86 pages.

MERCOID CONTROLS of the industrial type are featured in Bulletin 848 of the American Radiator Co., New York, N. Y. These controls, operated by a seamless metal bellows power element, function through the rocking of a glass tube containing mercury, which, to close the circuit, short circuit two terminals extending into the tube. They are designed to handle motors up to 1 H. P., direct on any commercial lighting circuit up to 220 volts, without the medium of any voltage-reducing transformer, relay, or other intermediate device. They are made in single and double circuit and double pole types. The folder is well illustrated with photographs and drawings showing the employment of Mercoids for various purposes.

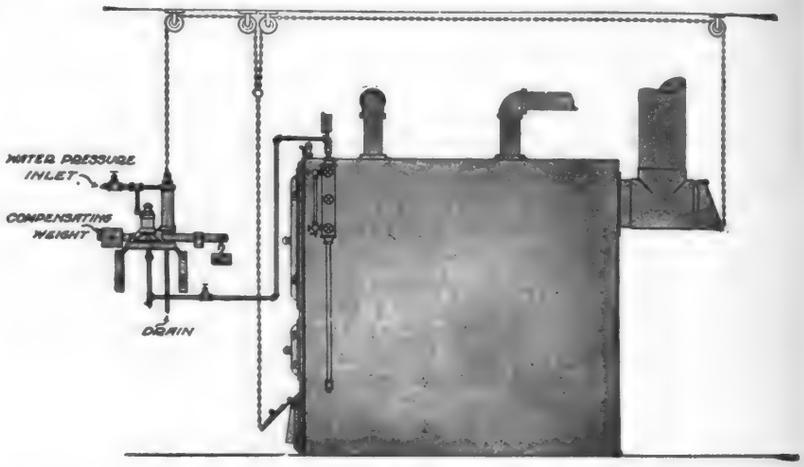
IDEAL ARCO HOME HEATER is described and its adaptability to installation in the living room of the home is shown in a bulletin issued by American Radiator Co., New York. This little heater, designed to provide for homes containing less than 8,000 cu. ft., appears as a miniature of the Type A heat machine. The firebox and body are in one piece,



Construction of Ideal Arco Home Heater

and the necessary openings in the front of the heater are made practically air tight by a large door, with special flange and safe-type locking handle. The heater is controlled by a single handle located over the door, as in the Type A boilers. The exterior is finished in enamel, and the heater could hardly be more attractive and cleanly in appearance.

VICTOR DAMPER REGULATORS for low-pressure and vapor heating boilers, medium-pressure power boilers and high-pressure power plants, are described, illustrated and priced in Bulletin 5A, distributed by Atlas Valve Company, Newark, N. J. The No. 1 low-pressure damper may be applied to a low-pressure heating boiler as shown, and is actuated by water pressure on either side of a double-acting piston, which is connected, through chains, to the boiler dampers.



No. 1 Victor Damper Regulator Attached to Low-Pressure Heating Boiler

The water pressure to the top of the piston is constant while the water pressure to the bottom of the piston is controlled by a diaphragm with a weighted lever, which rises and lowers with variations in the boiler pressure, thereby operating a pilot valve which applies the water pressure to the bottom of the piston.

When the steam pressure on the diaphragm is greater than the weights on the lever, the pilot valve is opened and the water pressure forces the piston upward, which by means of the chain, permits the ash-pit draft to close and opens the check damper.

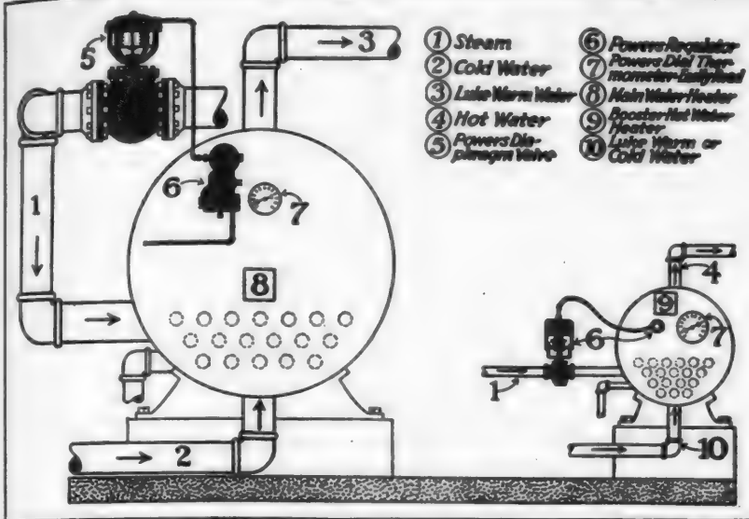
When the steam pressure on the diaphragm is less than the weights on the lever, the pilot valve is closed and the water pressure underneath the piston is discharged. This permits the constant pressure on top of the piston to force the piston down which by means of the chain opens the ash pit draft and closes the check damper.

GASTEAM HEATING SYSTEM is described in several loose leaf sheets distributed by James B. Clow & Sons, Chicago, Ill. In this system special radiators are employed, each fitted with a gas burner designed after specifications of the U. S. Bureau of Standards. The flow of gas to the burner is under control of a diaphragm regulator, so arranged that steam is not generated above 8 lbs. pressure. This is designed to prevent waste of gas and to result in uniform heat production. Diagrams are shown providing for the connection of such radiators in a conventional steam or hot water system, where they may either be used as above described; where small amounts of heat are required in moderate weather; may be used as ordinary radiators, taking steam or hot water from the house boiler; or may be used as a booster for the steam or hot water system in extreme weather. The sheets contain full specifications and instructions for installing, and tables showing gas pipe sizes for varying lengths of pipe to serve radiators of varying capacity.

Deaths

JOSEPH G. GEOGHEGAN, president of Gillis & Geoghegan, heating contractors, New York, met a tragic death Sunday morning, March 15, while driving in his car. He was on the highway between Huntington, L. I., and his home in Garden City. Apparently there were no witnesses to the accident. His car was found at the side of the road and Mr. Geoghegan's body was found alongside of the car with his skull crushed. He leaves a widow and five children. Mr. Geoghegan had been president of the company less than a year, succeeding his brother, Charles Geoghegan, whose death occurred last August. He was 49 years old.

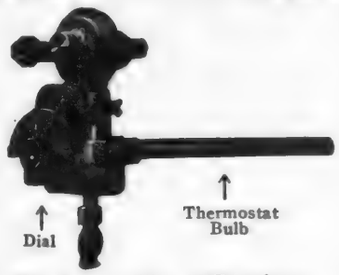
MICHAEL J. GIBBONS, Sr., founder and president of the M. J. Gibbons Supply Co., Dayton, O., died February 26 of pneumonia at his home in Dayton. He was 72 years old. Mr. Gibbons had been connected with the heating and plumbing industry throughout his business career. He organized the firm of Gibbons & Co., heating and plumbing contractors, in the '80's. Later the name was changed to Gibbons & McCormick. Mr. Gibbons became one of the leading heating and plumbing contractors in southwestern Ohio. His company went into the supply business in 1909 with the purchase of the plant of the Eureka Foundry Company. Mr. Gibbons was a cousin of the late Cardinal Gibbons.



This Diagram

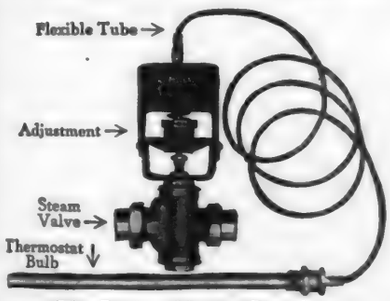
Typical installations of POWERS control on hot water storage tanks are here shown. At the left a No. 10 Regulator is used and on the right a No. 11. Further details of these regulators are given in the panels at the left, below.

POWERS regulators are each designed for a specific purpose, to meet specific conditions. No one regulator can fit all requirements. That is why we have developed so many types and designs.



The Powers No. 10 Regulator

No. 6 on the diagram at the left, above, indicates installation of this regulator. It is operated by air or water pressure. (Note the piping). A rugged, dependable regulator.



The Powers No. 11 Regulator

No. 6 on the diagram at the right, above, indicates typical installation for this regulator. It is self operating, without outside power. An accurate, simple, reliable regulator.

Powers Control on Water Heaters is Real Economy

In applying temperature control to ALL types of water heaters no other firm can offer you the breadth of experience or the wide variety of apparatus which we have perfected.

In studying the problems of your clients you no doubt find many places where accurate temperature control would save hundreds, perhaps thousands, of dollars a year. Every dollar spent for *hand* control of temperature is money gone forever, same as rent. Experience shows that money invested in Powers control pays handsome dividends.

Valuable Engineering Service

When you are confronted with any problems of temperature control let our engineers worry about it for you. They may be able to save you a great deal of time and needless trouble.

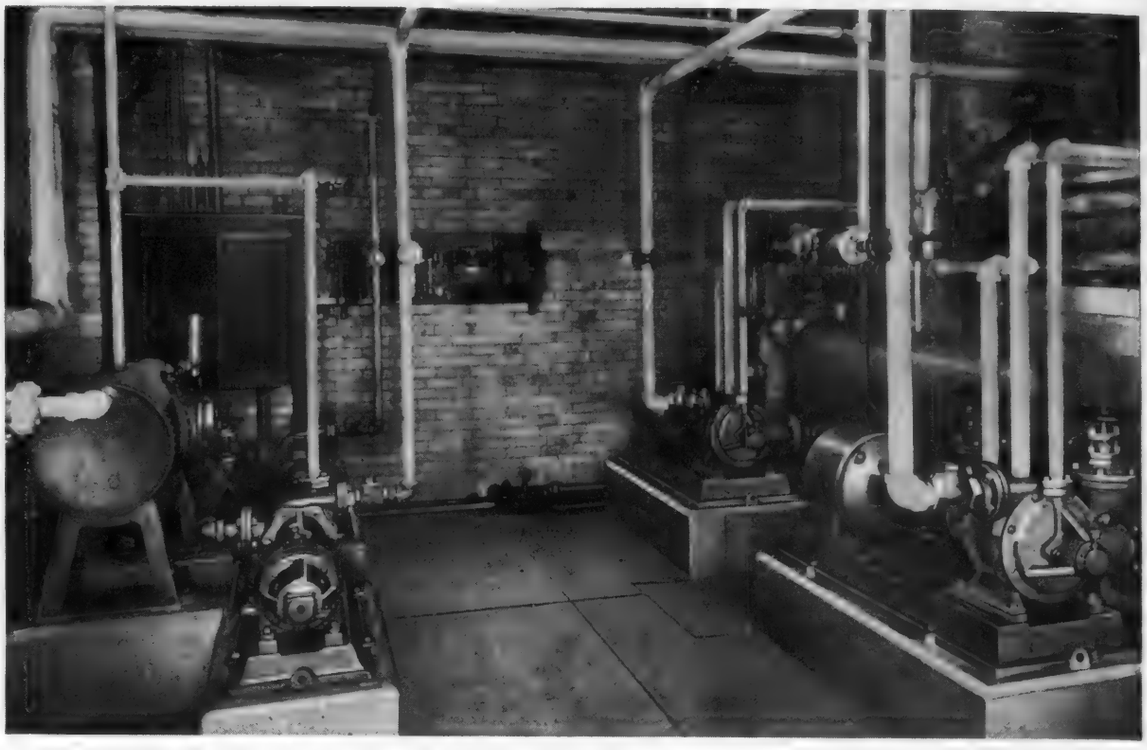
3021A

THE POWERS REGULATOR COMPANY

34 years of specialization in temperature control

2718 Greenview Avenue, Chicago

Atlanta				Philadelphia	CANADIAN OFFICES
Baltimore	Cincinnati	El Paso	Milwaukee	Pittsburgh	
Boston	Cleveland	Houston	Minneapolis	Rochester	Toronto Vancouver
Buffalo	Denver	Indianapolis	Nashville	St. Louis	Montreal Winnipeg
Butte, Mont.	Des Moines	Kansas City	New Orleans	San Francisco	Halifax Calgary
Charlotte, N. C.	Detroit	Los Angeles	New York	Seattle	



View showing two motor-driven Jennings Hytor Vacuum Pumps, and two motor-driven Jennings Hytor Condensation Pumps in the basement of the American Surety Company's Building, New York, N. Y.

Performance proves HYTOR dependability

BOTH Jennings Hytor Vacuum Pumps and Condensation Pumps are installed in the American Surety Company's Building, New York, N. Y. These pumps operate continuously, twelve hours a day, and, in the three years they have been in use, have given no trouble.

So dependable has been their performance that Mr. Ellingwood, Chief Engineer, says he is perfectly satisfied. He would install Hytors again.

What Jennings Hytors are doing for others, they will also do for you. There is no metal-to-metal contact in a Hytor that will cause the pump to wear out or the vacuum to diminish. And the unique manner in which the steam condensation is handled separately from the air, vapor and non-condensible gases accounts for practically a 50% saving in power, with a proportionate reduction in the cost of electric current.

There are many advantages in using Hytors that our engineer in your territory will gladly take up with you. Do not hesitate to get in touch with him—or write us direct.

NASH ENGINEERING COMPANY

So. Norwalk **Connecticut**

Branch Sales Offices in: Atlanta, Boston, Buffalo, Chicago, Cleveland, Dallas, Denver, Detroit, Houston, Indianapolis, Kansas City, Los Angeles, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Richmond, St. Louis, Salt Lake City, San Francisco, Seattle, Washington. In Canada: Montreal, Toronto and Vancouver. European Offices: London, England, Norman Engineering Co.; Brussels, Belgium, and Amsterdam, Holland, Louis Reijners & Co.; Kristiania, Norway, and Stockholm, Sweden, Lorentzen & Wettre.

Jennings Hytor

RETURN LINE AND AIR LINE VACUUM PUMPS CONDENSATION AND CIRCULATING PUMPS

Trade and Miscellaneous Notes

Coming Events

April 15-16, 1925.—Twelfth annual convention of the National Warm-Air Heating and Ventilating Association, at Cleveland, O. Headquarters at the Hollenden Hotel.

April 22-24, 1925.—Annual meeting of the American Welding Society at the Engineering Society's Building, 29 West 39th Street, New York.

May 19-22, 1925.—Sixteenth annual convention of the National District Heating Association at West Baden, Ind. Headquarters at West Baden Hotel.

May 26-28, 1925.—Annual meeting of the National Pipe and Supply Association at French Lick, Ind.

June 1-4, 1925.—Thirty-sixth annual convention of the Heating and Piping Contractors National Association at Detroit, Mich. Headquarters at the new Book-Cadillac Hotel.

June 15-17, 1925.—Semi-annual meeting of the American Society of Heating and Ventilating Engineers in Atlantic City, N. J.

Miscellaneous Notes

Wilkes-Barre, Pa. In connection with the forthcoming convention of the Pennsylvania State Association of Master Plumbers in Wilkes-Barre, May 13-14, an exhibition is being planned, which will include, in addition to heating and plumbing appliances, building construction and insulation materials, oil-burning devices, systems for burning small and cheap anthracite coal, and other devices of a kindred nature.

Washington, D. C. The organization is announced of the commission appointed by Secretary of Commerce Hoover, to visit and report upon the International Exposition of Modern Decorative and Industrial Arts in Paris in 1925 for the benefit of American manufacturers. The commission has established offices at 2 West 46th Street, New York. The chairman is Charles R. Richards.

Building Operations for February, 1925, as reported by the F. W. Dodge Corporation, compare closely with those of the early part of last year. February building contracts and 36 eastern States amounted to $299,260,000. This was slightly under the figure for February of last year and less than 1% over the figure for January of this year. Of the month's total, 45% was for residential buildings, 18% for public works and utilities, 13% for commercial buildings, 7% for industrial buildings and 7% for educational buildings. There has been a decided falling off in New York State and northern New Jersey, a slight decrease in the Northwest, a slight increase in the Central West, and a substantial increase in New England, the Pittsburgh district and the Southeast.

New York Department of Architecture, Sullivan W. Jones, State architect, announces that its projects under way or contemplated include the following: Heating Drill Shed, Cavalry Armory, Rochester, N. Y., (bids to be received about July, 1925); heating system improvements for State Normal School, Plattsburgh, N. Y., (bids to be received about June, 1925), tunnel and underground heating service lines, Craig Colony, Sonyea, N. Y., (bids to be received about April, 1925), heating repairs, Utica State Hospital, Utica, N. Y., (bids to be received March 25, 1925).

National Pipe and Supplies Association is planning for a large gathering of jobbers and manufacturers at its annual meeting at French Lick, Ind., May 26-28.

American Construction Council will

Pure Air Eliminates "Spring Fever"

Spring with its myriads of flowers and sunshine carries the call of the great out-o'-doors to the factory, office, store and shop.

Not everyone can enjoy Mother Nature's green but all can benefit by the fresh clean air of early Springtime.

Assist your clients in speeding production and eliminating "Spring Fever" by specifying Autovent Ventilating Equipment.

ACTIVE SALES OFFICES AND BRANCHES IN ALL PRINCIPAL CITIES

AUTOVENT FAN & BLOWER CO.
730-738 W. MONROE ST., CHICAGO

hold its forthcoming annual meeting in New York, May 8-9 at the Hotel Biltmore and will devote one of its sessions to a conference on better building, with special reference to ways and means of furthering the building of better homes and securing housing financing. Another session will be devoted to a national conference on elimination of construction peaks and depressions.

National Warm Air Heating and Ventilating Association, whose twelfth annual convention is scheduled for April 15-16 at the Hollenden Hotel, Cleveland, O., has arranged a full program which will include the following papers: "The Association's Research Work at the University of Illinois" by C. M. Lyman, chairman Advisory Committee; "Warm-Air Heating Research to Date" by Professor A. C. Willard; "Warm-Air Heating Research Recent Developments" by Professor A. P. Kratz; "Warm Air Heating Research, Additional Developments" by Professor V. S. Day; "The Use of Ozone in Residence Heating" by E. S. Hallett, chief engineer, St. Louis Board of Education. In addition, a number of topics are down for discussion, including one on "Humidity Data on Research Residence," "The Study of Temperatures at Floor, Ceiling and Breathing Line in all Rooms at Research Residence with Plant Operating with a single Recirculating Duct" and "Overall Plant Efficiency at Research Residence and Relation of Fuel Consumption to Outside Weather Conditions.

Arthur D. Little, president of Arthur D. Little, Inc., Boston, Mass., has been elected to succeed Charles H. Herty as chairman of the Advisory Committee of the Exposition of Chemical Industries which will be held September 28 to October 3, 1925 at the Grand Central Palace, New York.

American Institute of Electrical Engineers is holding its Spring convention in St. Louis, April 13-17, 1925.

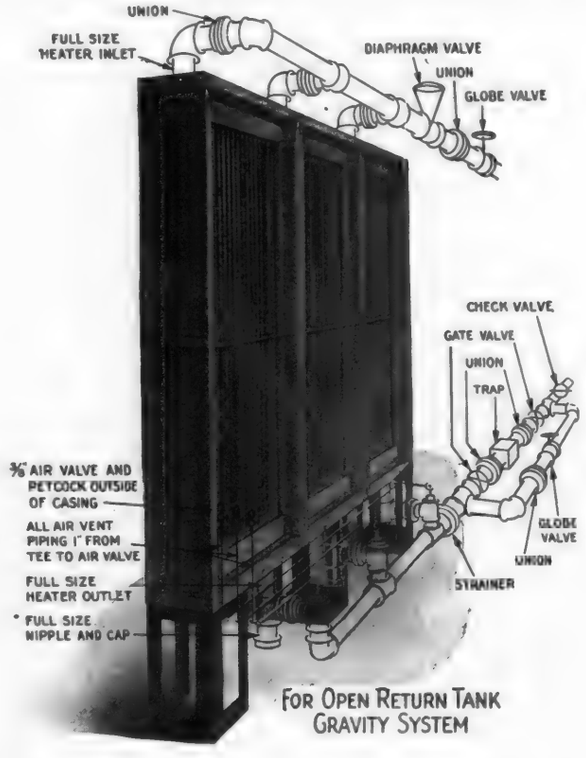
New York State Department of Architecture is installing a complete new set of files in its offices in Albany, N.Y. Manufacturers and material dealers are requested by the department to send catalogs and specification literature in duplicate to the Department of Architecture, Capitol, Albany, N. Y., and one set to the State Department of Architecture, 18th Floor, Fuller Building, Broadway and 23rd Street, New York.

National Industrial Conference Board of Technical Education, which has been making a study of technical education in its relation to the metal trade industries, reports that a need exists for broad courses in subjects that will develop the ability of clear thinking, analysis and judgment in the college education of men preparing for technical occupations in industry. Both management and college trained employes agree that better results will be accomplished through the use of technically trained men in metal industries by closer relationship between the colleges and the industries. One suggestion has been made that the metal trades industries provide training for college men after their absorption into the industry.

Industrial Conditions continue to improve at a conservative pace, according to a monthly report of the National Industrial Conference Board for January on wages, hours and employment, while a tendency toward increase in the purchasing value of a dollar is indicated by the conference board's report on the cost of living. This report shows a decrease of 1 1/10% between January 15 and February 15.

American Welding Society has announced the program for its annual meeting in the Engineering Society's Building, New York, April 22-24, 1925. The opening day will be devoted to committee meetings on resistance welding, gas welding and electric arc welding. On the third day of the session, April 24, a symposium is scheduled on (1) methods of inspecting welds, (2) testing the skill of operators.

George A. Tyler of the International Heater Company, Utica, N. Y., celebrated, on April 1 of this year, his fifty-third anniversary as a salesman for that company. When he joined the company in 1872 it was a small manufacturing business of stoves and ranges conducted by Russel Wheeler. During



FOR OPEN RETURN TANK GRAVITY SYSTEM

AEROFIN CORPORATION
750 Frelinghuysen Avenue
Newark, N.J.
L. C. Soule, Sec'y and Chief Engineer

AEROFIN
Fan-System Heating Surface

TO ENGINEERS AND ARCHITECTS:

Aerofin Saves Space and Weight.

The light weight and non-corrosive features of Aerofin, together with its unit construction, space saving and because it comes to the job already encased and ready for steam connections, demonstrates its superiority, and for this reason we believe Aerofin merits being incorporated in your specifications. SINCE THERE IS NO EQUAL TO AEROFIN, WHY NOT SPECIFY IT OUTRIGHT? At least, we ask you to specify Aerofin as a standard and to figure out the exact sizes and number of units required so that the contractor will know what to figure on.

TO THE CONTRACTOR:

SAVE TEN CENTS PER FOOT OF HEATING SURFACE by erecting the (completely encased) Aerofin Units in the same number of HOURS as you would need DAYS to erect the heavy heaters.

SAVE MORE MONEY with Aerofin on account of the smaller number of steam and return connections required.

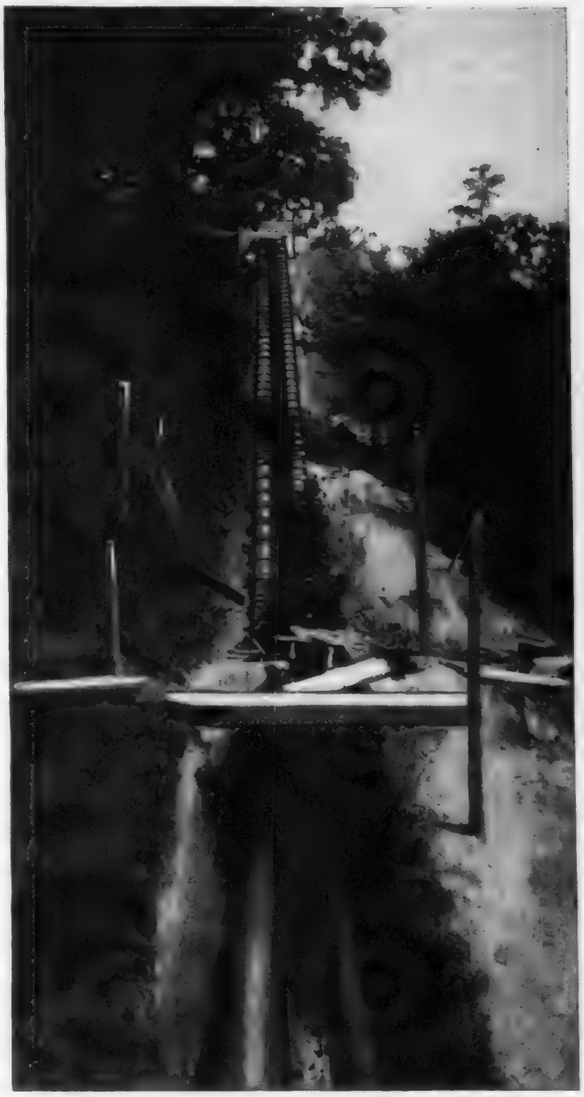
DON'T FORGET the saving in freight and cartage.

No extra reinforcement of the building construction required with Aerofin—may be suspended from ceiling with small angles and rods, without expensive platforms—may be handled with only ordinary care and assembled without using any block and tackle or scaffolding.

These features demonstrate that you can really save money by installing Aerofin altho the first cost, f. o. b. factory, may be a trifle higher than that of other fan-system heaters.

Illustration shows the ease with which several units high or wide of Aerofin may be assembled together by simply bolting thru the template punched flanges.

Aerofin Is Sold ONLY by Manufacturers of Nationally Advertised Blower Heating Apparatus



A responsibility that starts with the planning —and never ends

IF users of the Johns-Manville Underground System of Insulation only thought of it as so many feet of piping insulated by a certain method, there wouldn't be nearly as many miles of the System in service as there are today.

A Johns-Manville Installation is more than a sale of material, it is the promise of satisfactory service in the years to come. This promise is backed by the responsibility of a nationally known organization that has been successful in insulation work for over fifty years—and which expects to be in business for a long time in the future.

JOHNS-MANVILLE Inc., 292 Madison Avenue at 41st Street, New York City.
Branches in 62 Large Cities. For CANADA: CANADIAN JOHNS-MANVILLE Co., Ltd., Toronto.

Through Asbestos and its allied products
INSULATION
BRAKE LININGS
ROOFINGS
PACKINGS
CEMENTS
FIRE PREVENTION PRODUCTS

JOHNS-MANVILLE

Underground System of Insulation

the interval Mr. Tyler has seen the industry develop to its present proportions and his own company attain its present size.

W. H. Carrier, president of the Carrier Engineering Corporation, Newark, N. J., has been in Europe on a hurried business trip, sailing February 11 on the George Washington.

Henry R. Kent & Co., Rutherford, N. J., engineers for power and heating and ventilating equipment, announces the withdrawal of Carl M. Vail from the existing partnership. The business will be continued by Mr. Kent under the same partnership name.

Underwriters' Laboratories, Chicago, has forwarded to oil-burner manufacturers copies of tentative specifications for the design and construction of oil burners, asking for constructive criticism. Proper co-operation on the part of those interested should result in the promulgation of only such conditions and restrictions as will be an actual benefit to the industry.

University of California will make an exhaustive study of ventilation in the university buildings, under Dr. F. L. Kleeberger, professor of physical education.

Electricity will heat the new building of the Richmond, Cal., *Independent.* Flush-type heaters are used in the business portion of the building, while in the press rooms the portable type will be used on account of the obvious advantage.

Chattanooga, Tenn., is having a fight on the smoke evil, and one of the suggestions that has been given consideration is a campaign for the use of oil burners for domestic as well as industrial use. It is reported that there are a large number of domestic burners in use, giving satisfactory results.

E. S. Hallett, chief engineer of the St. Louis public schools, recently addressed a meeting of the Indianapolis school commissioners, architects and members of civic organizations on the subject of school construction, heating and ventilating.

Detroit Edison Company has asked the city commissioners to allow the reduction of the heating value of the gas supplied from 600 B. T. U. to 530 B.T.U. The company offers to supply gas of the low standard at the present rate, $1.20, for a five-year period.

Posey County, Indiana, will again advertise for bids for the various elements of a Memorial coliseum, to be erected in memory of world war soldiers and sailors from the county. This project has been the cause of feeling between local factions, and the present activity is the result of a decision by the Indiana supreme court. The building will cost about $200,000, of which about $30,000 will be for heating and ventilating.

Illinois College, Jacksonville, Ill., is campaigning for a $750,000 centennial fund, of which $50,000 will be allotted for a heating plant.

Portland, Oregon, as the result of several fatalities in connection with gas furnace accidents, has decided that all gas heating apparatus in the city should be immediately inspected, particular attention being given to chimney and flue conditions. The Portland Gas & Coke company, through its representative, L. L. Levings, has offered to institute and finance an immediate and thorough inspection of all makes of gas heating appliances in the city as quickly as it can safely be done, and submit an unbiased report of its findings to the city council.

This offer has been approved. The report to be submitted will undoubtedly be made a basis for legislation to cover the inspection and installation of gas heaters.

Manufacturers' Notes

Trane Company, LaCrosse, Wis., announces the opening of a new branch office in Zanesville, O., thus adding another name to its list of nineteen branches. The new branch will be under the management of George W. Newey. Mr. Newey has long been connected with the industry, having conducted a heating contracting business in Cleveland, O., for eight years under the name of Newey & Bartholomew. In recent years he has acted as a sales representative for the U. S. Heater Company and more recently for the International Heater Company.

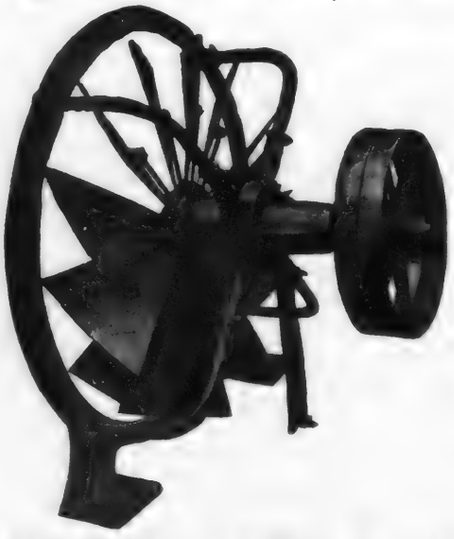
SELF OILING BEARINGS

AN EXCLUSIVE AND PATENTED FEATURE OF

Supreme Multiblade Disc Fans

Successfully Applied to Mechanical Furnace Systems.

Drying, Cooling, Ventilation and General Factory Service.



Note accessibility of bearings—Located **outside** of fan—Positively dust proof.

The blade design is rendering efficient and economical operation under all conditions of service.

SUPREME HEATER & VENTILATING CORP.

ENGINEERS AND MANUFACTURERS

ST. LOUIS, MO.

SALES ENGINEERS—Some desirable territory is open on this line

Giving the Lake Shore Drive Hotel

Controlled Service Hot Water on Eighteen Vast Floors

EVERYONE connected with heating will be interested in learning how Sylphon Temperature Regulators met the problem of *controlled* service hot water for 18 vast floors of the Lake Shore Drive Hotel in Chicago.

Three hot-water heaters were used, and control obtained by installing a standard No. 930 Sylphon Temperature Regulator on each as shown. One heater takes care of the water for the basement and first floor; another from the first floor to the ninth floors; the third from the ninth to the eighteenth. The heaters use exhaust steam from the ice machine to heat the water in summer, and exhaust and make-up on the heating system in winter.

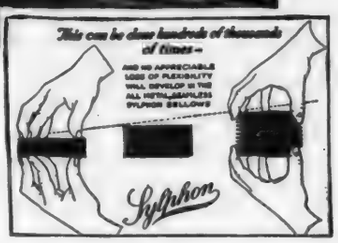
Hotel's Chief Engineer says this of these Regulators

"They have always kept the water at a very even temperature and have functioned properly at all times."

Self-contained, Sylphon Regulators have but three active control elements

—a thermostatic bulb, flexible tubing, and the Sylphon bellows used as the expansion member. All three are filled with a highly volatile liquid. The bulb is installed in the tank, valve in steam line. The slightest fall in temperature of the water immediately registers on the volatile liquid in bulb, tube and bellows, causing the latter to open the valve and admit sufficient steam to keep the water at the wanted temperature.

Thus no auxiliary valves, air lines, electric currents, water lines or drips are needed to operate the Regulator.



A life-time of control guaranteed by the Sylphon bellows

Sylphon Temperature Regulators are really built around the marvelous, seamless Sylphon bellows. Drawn from a flat sheet of metal, *without soldered seams*, and used as the expansion member, it guarantees a life-time control of this job. The diagrammatic cut graphically illustrates its extreme flexibility.

Engineering Service

We invite everyone connected with heating to an open use of this nation-wide Sylphon engineering service, where they may draw on our 20 years of gainful experience in temperature control problems. As a first step get Bulletin WTR-105.

This is No. 930 Sylphon Temperature Regulator, lever type—a standard instrument and the one used in the Lake Shore Drive Hotel Installation.

THE FULTON COMPANY KNOXVILLE, TENN.

ORIGINATORS AND PATENTEES OF THE SYLPHON BELLOWS

Sales offices in: NEW YORK, CHICAGO, DETROIT, BOSTON, PHILADELPHIA, *and all the principal cities in U. S.*
European representatives: Crosby Valve & Engineering Co., Ltd., 41-42 Foley Street, London, W.I., England
Canadian representatives: Darling Bros., Ltd., 120 Prince Street, Montreal, Canada

Sales Force of EverHot Heater Company at First Annual Sales Convention in Detroit

Autovent Fan & Blower Co., Chicago, Ill., has appointed as its representatives in the Cleveland territory, Sixt & Day Specialty Company, whose offices are located at 529 Guardian Building, Cleveland. Mr. Sixt is an experienced ventilating engineer thus qualifying him to give expert advice on the selection and use of the Autovent and Uniblade lines of fans and blowers manufactured by this company.

Hoffman Specialty Company, New York, has issued a revised price list and trade discount sheet, effective March 25, 1925.

Minneapolis Heat Regulator Co., Minneapolis, Minn., announces the establishment of its seventh branch office, in St. Louis, Mo. This office is as a direct factory branch and will be under the management of George Kingsland. A complete stock of regulators will be carried for shipment f.o.b. St. Louis, and the office, it is further announced, is prepared to offer complete installation service for St. Louis and vicinity.

EverHot Heater Co., Detroit, Mich., manufacturer of EverHot automatic water heaters, held its first annual sales convention at its plant in Detroit, March 3-5. In addition to its sales force the company had as its guests 23 distributor representatives. One of the speakers at the first day's session was I. V. Brumbough of the Bureau of Standards, Washington, D. C., who spoke on "What the Bureau of Standards is Doing for Manufacturers of Gas Appliances." Others who addressed the convention were: President Frank W. Shuell, General Sales Manager E. E. Ledbetter; W. I. Vallett, whose subject was "Field Work"; J. J. Cheviron, who discussed "Building Quality Boilers"; and Secretary J. A. Appelhof, who gives some interesting points on credits.

American Radiator Co., New York, announces the appointment of George F. Scott as purchasing agent, effective February 16. Mr. Scott has many years' service with the company in various capacities.

Newport Boiler Co., Chicago, Ill., announces that hereafter Newport boilers will be manufactured in the new factory at Charles City, Ia. Through the increase of facilities and gain in efficiency procured by this change, it is stated, Newport boilers will now be sold at approximately the same price as ordinary boilers and ample stock, it is added, will be carried as heretofore in the company's Chicago warehouse. The Newport Boiler Company has also been appointed representative in the Chicago territory for Aero radiators of which 200,000 sq. ft. will be maintained in stock in the company's Chicago warehouse. The company is also representative for the Sylphon specialties in the Chicago district.

W. H. Pearce & Co., Chicago, Ill., manufacturers of central station equipment, announces the retirement from active business activity of the president of the company, W. H. Pearce, Sr. The business of the company will continue under the direction of W. H. Pearce, Jr., and W. L. Klingelhofer, formerly of the American Foundry & Construction Co. of Pittsburgh, who will be in charge of sales. Others indentified with the company include W. H. Hendrickson; H. Hall, Asheville, N. C., representing the company in the South; W. A. Laub & Co., Philadelphia representative; Ray Engineering Co., Boston, New England representative; and Robert Ilett, Toledo, O., Ohio representative. The Pearce company's line includes Crescent conduit casing, expansion joints, anchors, tunnel brackets, pipe rests, traps and meters.

National Radiator Company, Johnston, Pa., has appointed David H. Cuyler as a member of its organization with headquarters at the company's Chicago warehouse, 1038 South Kolmar Avenue. Mr. Cuyler was formerly with the Wolff Manufacturing Company in Chicago and, previous to that, represented the Haines, Jones & Cadbury Co., in Charlotte, N. C.

Whitlock Coil Pipe Co., Hartford, Conn., announces the removal of its New England office from 514 Atlantic Avenue, Boston, and the opening of a direct sales and engineering office at Room No. 511, 6 Beacon Street, Boston. This office will handle all classes of Whitlock products, including water heaters, heat-exchange apparatus, pipe coils, etc., and will be in charge of the following engineers who have long been in the company's employ: William Wilcox, S. T. Green and C. I. Babcock.

Milwaukee Valve Co., Milwaukee, Wis., has appointed E. W. Aubinger, vice-president in charge of sales. Mr. Aubinger was formerly connected with the Pierce, Butler & Pierce Mfg. Corporation for ten years, with an interval of two years when he acted as general manager of the heating department of Haines, Jones & Cadbury Co. of Philadelphia. At the time of his present appointment he was secretary and general sales manager of the Wolff Manufacturing Corporation, Chicago.

O-E Specialty Mfg. Co., Milwaukee, Wis., has appointed Bernard J. McCarthy as special representative in New York City, with headquarters at 50 East 42nd Street.

MANUFACTURED WEATHER
makes
"Every day a good day"
Humidification Dehumidification
Heating · Ventilation · Purification
Drying
Carrier
Engineering Corporation
750 Frelinghuysen Ave. Newark, N. J.
Boston Buffalo Chicago New York Philadelphia Los Angeles
SEE OUR DETAILED DATA IN ASH & VE. GUIDE
SEE OUR DETAILED DATA IN ASH & VE. GUIDE

Adjustable
Practical
Adaptable

OUR installation foreman wanted hangers that could be as easily adjusted *after* installation as before. Our engineering and designing departments took these practical suggestions and worked on them until they produced such a hanger. That's why Grinnell Hangers offer an ease and range of adjustment that is unequalled.

A thousand road operating men wanted hangers that could be put up easily—that didn't require turn-buckles —that were flawless in construction. That's why Grinnell Hangers are so practical.

Our manufacturing department wanted to cut down the expense and delays of making special hangers for unusual installations. So the Grinnell Line of hangers includes a 100 standardized items which are adapted to all possible structural conditions.

You can now buy any of these 100 kinds of Grinnell Hangers. You can save on time and labor costs on your installations as we are doing.

Write for the new 120-page Grinnell Hanger Catalog. Address Grinnell Company, Inc., 280 West Exchange Street, Providence, R. I.

GRINNELL

Fittings, Hangers, Valves, Pipe Bending, Welding, Piping Supplies, Etc.

Williams Oil-O-Matic Heating Corp., Bloomington, Ill., has awarded a contract to the Austin Construction Company of Chicago for the first unit of its new manufacturing plant in Bloomington. The plant will be built on land recently purchased from the Association of Commerce east of the Meadows manufacturing plant. The cost of the building will be $55,000, and the machinery is estimated to cost $70,000, bringing the total cost up to $125,000. The structure will be one story, 3300 ft. long and 100 ft. wide and will be of brick and concrete. It will have a monitor roof 22 ft. in height, and the initial building is intended for manufacturing purposes only. The layout provides for a number of additional buildings including the foundry and an office in the administration building. It is estimated that the cost of the construction and equipment of the four manufacturing buildings and the foundry, comprising the plant, will be approximately $500,000 which, added to the cost of the land, represents a total investment of $600,000.

C. J. Tagliabue Mfg. Co., Brooklyn, N. Y., announces the organization of an Engineering Research Department which will be under the direction of Victor Wichum.

Jarecki Mfg. Co.'s Building C of its new plant in Erie, Pa., was used for the recent sixteenth annual automobile show of Erie.

American Radiator Co., Buffalo, N.Y., made use of the radio broadcasting station WGR of Buffalo to conduct a weekly radio concert during which the standing of the various branches were announced in the company's Spring sales campaign.

Hardinge Fuel Oil Heating Co., 23 East Congress St., Chicago, Ill., has appointed M. G. Harbula as one of its sales engineers. Mr. Harbula was formerly New York manager of the Atmospheric Conditioning Corporation of Philadelphia, and since 1912 has been connected with Warren Webster & Company, Camden, N. J. During the war Mr. Harbula served as a lieutenant in the air service.

Bayley Mfg. Co., Milwaukee, Wis., announces the appointment of H. W. Page as vice-president and general manager. Mr. Page has long been identified with the industry. In 1906 he was a draftsman in the Chicago office of the B. F. Sturtevant Company and later was made a sales engineer. In 1911 he was appointed western manager and in 1917 was made assistant general manager of the company at Hyde Park, Boston, in charge of sales and advertising. When the Sturtevant company bought the Corliss plant Mr. Page organized the western division of the company, in July, 1923, and was appointed general manager of the western division.

Herman Nelson Corporation, Moline, Ill., has let a contract for a $40,000 addition to its existing plant.

Central Station Heating Notes

Kewanee Public Service Co., Kewanee, Ill., has opened up a problem for residents of that city by deciding to discontinue central heating with the expiration of the present heating season.

Logan County, Ohio, is considering a proposition to have a central heating plant to provide for the county court house, jail and memorial hall. The use of an oil burning plant is under consideration.

Rock Rapids, Iowa, will have lower rates on light and heat from its central station, as a result of the accumulation of a substantial surplus from operations at the present rate. The old rate for electricity was 8c net, and the new will be 6c net. The old rate for steam was 80c per 1,000 lbs., and the new will be 70c.

Detroit, it is reported, will have a central heating plant to supply heat to the receiving hospital, the municipal court building, the new police headquarters building and the civil service building.

Ottawa, Canada, it is reported, will have a municipal central heating plant to cost $200,000.00.

California Institute of Technology, Pasadena, is considering the erection of a central heating plant that will cost nearly $100,000.00.

New Incorporations

Howell Plumbing & Heating Co., 4214 Troost Ave., Kansas City, Mo., capital $10,000. Incorporators: C. M. Howell, L. P. Buehner, Everett D. Howell and S. A. Brewer.

Carnegie Plumbing & Heating Co., Carnegie, Pa., capital $25,000, to continue the business of Huttelmaier & Craig & Sage. The new company has taken quarters at 356 East Main Street.

Stearns-Flint Co., Lynn, Mass., capital 100,000 shares, no par value, to conduct a general plumbing and heating business. Incorporators: Frederick S. Stearns, Fred W. Flint, Ellwyn A. Mitchell and Ralph N. Hubbard.

Downey Heating Co., Milwaukee, Wis., capital $50,000. Incorporators: Paul C. Downey, H. G. Phillips and J. A. Dillon.

Binghamton Fuel Oil Heating Co., Binghamton, N. Y., capital $200,000, to manufacture heating apparatus.

Domestic Oil Heating Corp., New York, capital $30,000, to manufacture heating equipment. Incorporators: C. Huntington, H. W. Gaston and H. G. Knowles.

Arsenal Oil Burner Co., Maryland, Balto., Md., capital $10,000. Incorporators: Wm. L. McGinnis, Clarence A. Fifer and Herman C. Koschwitz.

Middletown Plumbing Supply Co., Middleton, N. Y., capital $100,000. Incorporators: G. A. Code, K. G. Merwin and W. C. Fallon.

Boehike Oil Burner Co., Chicago, Ill., capital $10,000, to manufacture oil burners and heating specialities.

Engineering Products Co., Portland, Oreg., capital $10,000, to manufacture heating and refrigerating equipment. Incorporators: J. L. Prulatour and Kenneth Coleman.

Gill Oil Burner Co., Fall River, Mass., capital $25,000 and 250 shares of common stock, no par value. Incorporators: Francis B. Lyons, Thomas E. Lyons, Ellen Lyons and John A. Lyons.

Harvey-Whipple Oil Burner Co., Springfield, Mass., capital 1,000 shares of stock, no par value. Incorporators: Walter C. Harvey, Edward J. Dwyer and Ray G. Whipple.

J. R. S. Specialties Mfg. Co., 535 South Ocean Ave., Patchogue, N. Y., capital $100,000, to manufacture heating and plumbing specialties and equipment. Incorporators: James R. Smith and others.

United Oil Burner Corp., Boston, Mass., capital $75,000 and 1,500 shares of stock, no par value, to manufacture oil-burning apparatus. Incorporators: Earl L. Ridley, Eileen L. Flynn and John A. Shaw.

Richardson, Back, Graham & Karmine, Phila., Pa., capital $50,000, to manufacture heating specialties.

F. D. Kirby, Inc., Boston, Mass., capital $50,000, to deal in heating and plumbing supplies. Incorporators: Edward J. Dowd, (president), Francis D. Kirby, (treasurer), and Lucil P. Herlihy, (secretary).

Big Temporary Heating Plant for National Flower Show

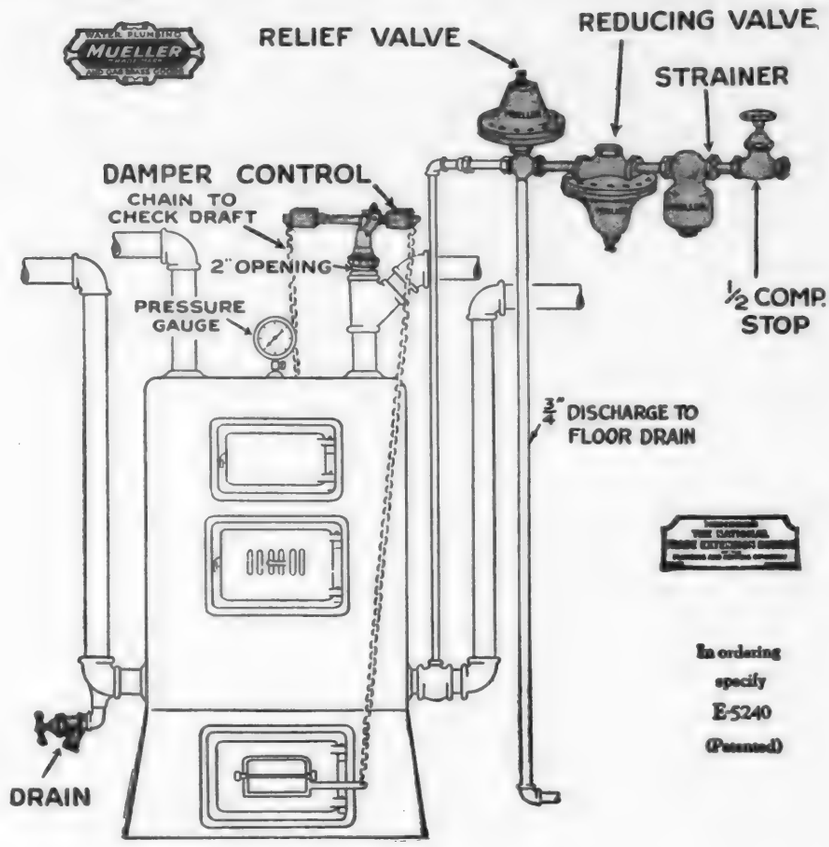
An interesting example of speed in meeting an unusual heating demand has come to light in a story from Kansas City, where, during the last week in March, the National Flower show was held, in a temporary enclosure, mostly canvas.

The E. K. Campbell Heating Co. handled the job, and a brief summation of some of the features is given to show what can be done under adverse conditions.

Nearly 5,000,000 cu. ft. of space to heat to 60° F., practically all walls of canvas, and seventeen days elapsed time between the placing of the contract and the demand for heat that must be reliable and uniform to protect the flowers on exhibition.

Seven heating units were installed, three having double furnaces. The products of combustion are passed from each unit into large radiating drums, and 6-ft. fans drive the air over the heaters and into the proper sections of the exposition.

The hourly loss is estimated at about 9,000,000 B. T. U. About twelve tons of coal are used per day. Eight of the furnaces and all of the radiating drums were built for this contract.



Cash In on This Opportunity Now

The best time to sell automatic heat control systems is while the customer's troubles with the ordinary boiler are fresh in his mind. The Mueller System reduces to the smallest degree the care and responsibility of attention to the heating system. That's what the householder wants—that's why the Mueller System is so popular. No expansion tank—no worry—no trouble.

You make a good profit on each new installation. It's shipped already assembled and can be installed in an hour. Operates on city water pressure—insures steady, even heat.

MUELLER CO.
(Established 1857)

FACTORIES: Decatur, Ill., Port Huron, Mich.

Canadian Factory
Mueller, Ltd., Sarnia, Ontario

Branches
New York, San Francisco, Los Angeles

MUELLER

To Co-operate With Anthracite Operators Association

In accordance with a movement initiated by the Philadelphia Chapter a resolution has been adopted by the council of the A.S.H. & V.E. providing for the appointment of a committee to co-operate with the Heating and Piping Contractors National Association, American Institute of Architects, National Association of Boiler and Radiator Manufacturers and the National Warm Air Heating and Ventilating Association with the object of fostering a plan of fuel economy and the use of small sized anthracite coal. President Dibble appointed as the members of this committee, J. I. Lyle, chairman, M. C. Gillett, J. H. Walker, F. Paul Anderson and Thornton Lewis.

Growth of Warren Webster & Co. Since 1888

Developed from a feeble start in a small rented store thirty-six years ago, through a modest establishment that required five additions between 1909 and 1923, to a modern plant with every facility for proper engineering design, research and manufacture, Warren Webster & Co., Camden, N. J., picture their life achievements in a photographic folder just from the press. A picture of the Victor Talking Machine plant at Camden is coupled with the information that a Webster system is installed therein and in over 6,000 other industrial plants. The Atlantic City High School, and 800 other schools were equipped during 1923 alone. There follow many pictures of buildings of various types, residences, skyscrapers, hotels (all the Statler group), hospitals, public buildings and churches which house the 30,000 Webster installations.

ENGINEERING FOUNDATION issues a little volume descriptive of the origin, scope and activities of this organization, which was initiated by Ambrose Swasey, a past president of the American Society of Mechanical Engineers. Its board of trustees is comprised of three members from each of the four national engineering societies, and the main function is to aid these founder societies jointly and severally in their research activities. Much useful research work has already been accomplished, and plans are under way for important investigations along varied engineering lines.

PATENT AND PROTECT
Your valuable inventions
and
Register your trade marks.
Prompt attention. Superior Service
Lester L. Sargent, Patent and Trade Mark Atty.
524 10th Street, Washington, D. C.

WANTED

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

WANTED—Designer and patentee of metal portable window ventilator desires to arrange with some concern to manufacture and distribute his product on a royalty or other satisfactory basis. Window ventilator in question pronounced by many competent authorities as being the very best ever developed and capable of meeting fully the public's requirements without any of the drawbacks commonly found in window ventilators. Address Box 41, care Heating and Ventilating Magazine.

SALES ENGINEER WANTED — Sales Engineer acquainted with ventilating trade to represent large established firm located in New York City introducing a new ventilating system superior to those now in use. Address, state qualifications, age and compensation expected, Box 43, care Heating and Ventilating Magazine.

FOR SALE—No. 5 D.W.D.I. Sirocco, 40 H.P. motor, 75000 C.F.M. Sirocco air washer with electric pump, 2052 sq. ft. 50-in. Vento, all or part, like new. A bargain for immediate delivery. Address Box 44, care Heating and Ventilating Magazine.

BUSINESS OPPORTUNITY—I am looking for a young man from 21 to 32 years old who in turn is looking for an opportunity in the heating and ventilating business.

A college technical education is not necessary, nor is it a handicap. What I want is inherent material, with which to mould success as I have done with many young men.

You must, however, be the practical business or sales type first and then the more you like mechanics and engineering the better.

I am the manager of one of the fastest growing and most progressive concerns indentified with the heating and ventilating manufacturing and engineering industry.

If you are employed in some contractor's or engineer's office and are seeking greater opportunities or if you are a young graduate engineer it may pay you to write me, giving full particulars regarding yourself. Address Box 42, care Heating and Ventilating Magaine.

CANADIAN DISTRIBUTORS with warehouse facilities and Dominion wide connection in heating field seek additional lines. Address Box 124, care of Heating and Ventilating Magazine.

SALES ENGINEER WANTED — Sales engineer acquainted with heating and ventilating trade to represent, in special territory, superior hot-blast heaters. Liberal arrangement to a capable, live wire. Address, with experience and qualifications, Heating, 710 Union Trust Building, Chicago, Ill.

DRAFTSMAN WANTED — Heating and ventilating draftsman with at least two years' college training. In reply state education, experience, age, when available, salary required and send sample of drawing. Smith, Hinchman & Grylls, architects and engineers, 800 Marquette Building, Detroit, Mich.

POSITION WANTED—Construction engineer and superintendent thoroughly experienced in supervising, erecting and estimating heating and ventilating, power and industrial piping, desires permanent connection with future possibility of purchasing interest in live concern. Address H. A. Erickson, care H. B. Buxton, 180 West 238th Street, New York City.

ENGINEER WANTED, technical, with practical knowledge of hot water and domestic heating; to such a man with vision, executive ability and some capital, seeking possibilities, a rare opportunity is offered with new company. Address Box 45, care Heating and Ventilating Magazine.

POSITION WANTED.—Estimator, engineer or superintendent thoroughly experienced in sheet metal ventilation work desires position with reliable heating and ventilating concern. At present employed, years of practical experience. Address Box 490, care Heating and Ventilating Magazine.

REPRESENTATIVES OF VALVE OR SPECIALTY MANUFACTURERS. —New England sales organization of three high class men in constant and intimate contact with New England heating and plumbing jobbers, contracting and industrial trade wish connection representing valve or specialty manufacturers. Address Box 481, care Heating and Ventilating Magazine.

POSITION WANTED. — Mechanical Engineer, technical college graduate, twelve years practical experience, married, age 36, desires permanent connection with industrial corporation maintaining or contemplating the organization of an engineering department. Handle all phases of mechanical and electrical design, installation and maintenance work. Address Box 46, care Heating and Ventilating Magazine Co.

POSITION WANTED.—Salesman connected with prominent manufacturers' agent in New York City for past five years can give honest representation to manufacturers desiring distribution to heating and plumbing supply jobbers in metropolitan market. Highest references. Address Box 47, care Heating and Ventilating Magazine.

AN AFFILIATION OF IMPORTANCE

to Every Industry Depending on Conditioned Air for Successful Operation

EFFECTIVE at once, all work of the Air Conditioning Department of the American Blower Company, Detroit, Michigan, will be handled exclusively by, and contracted through, Drying Systems, Inc., Chicago, Ill.

This arrangement has been made for the sole purpose of better serving our old customers and those industries which depend, for their successful operation, on precise atmospheric conditions. That the affiliation will offer a closer cooperation with manufacturers is assured by the fact that it combines the highly specialized engineering services of one concern with the unusual manufacturing facilities of the other—both of whom are leaders in their respective fields.

The organization of Drying Systems, Inc., which has been engaged in this class of work for a number of years, is now augmented by several experts from the American Blower Company, who are specialists in various lines of Air Conditioning Engineering. Sirocco equipment, manufactured by the American Blower Company, and recognized as standard throughout the industrial world, will be used exclusively on all installations.

The advantages of design and service, offered by this logical affiliation, will justify investigation for any Air Conditioning problem. All details have been perfected so that your requirements will receive immediate attention.

(429)

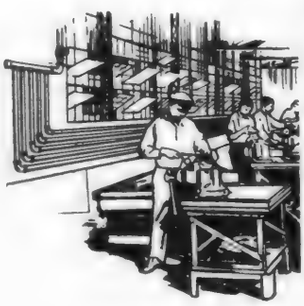
AMERICAN BLOWER CO.
Detroit, Mich.

DRYING SYSTEMS, INC.
Chicago, Ill.

Industrial Heating That's Easy to Control and Wastes No Heat

SUPPOSE a heating plant is designed for an outside temperature of 20 degrees below zero. Most days are not that cold. Consider what happens when the outside temperature is 20 degrees *above* zero.

1. If it is a direct radiation system the men try to turn off surplus heat in the radiators; find it a slow, difficult process; temperature gets too high; working conditions are bad.



2. They soon learn the easy way to control heat is to open the windows. The waste heat doesn't cost them anything.

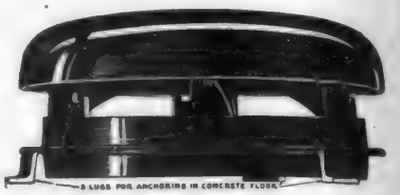
3. If the plant is equipped with Twinfan heaters a snap of the switch turns off the heat whenever the temperature starts to rise. Much easier than opening a window. No heat wasted.

Do your customers know these facts? Do you know how you can profit by telling them? Let us explain.

DWYER EQUIPMENT COMPANY
4534 W. NORTH AVE. CHICAGO, ILL.

A Quality Device at a Popular Price

When



MUSHROOMS

are mentioned

ENGINEERS

instinctively think of the one satisfactory under seat Vent in

AIR-DISTRIBUTION

for **AUDITORIUMS**

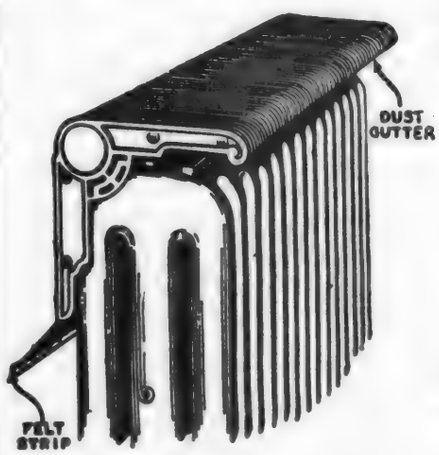
"THE NOTCH"

MADE ONLY BY

KNOWLES MUSHROOM VENTILATOR CO.

202 Franklin St., New York

ACME RADIATOR SHIELDS



are a necessity in every home or building.

All Metal Design

Protection to walls and draperies is guaranteed

ACME shields are neat in appearance, strong and durable.

The price is right. Shipments are prompt.

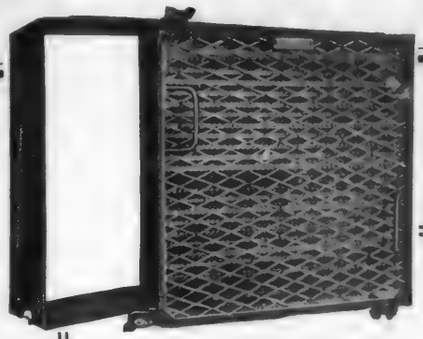
Live aggressive agents are wanted.

Write for Particulars

ACME RADIATOR SHIELD COMPANY

320 Central Office Building Cincinnati, Ohio

Clean Air in Bank Ventilation



Frame and Cell
New Model Type U2

Outstanding Features
of
Midwest Air Filters

An installation is built up of standard interchangeable units, (a frame and filter cell 20" x 20" x 6½" overall, with a capacity of 800 C. F. M. per unit.) A positive air-seal is provided between each cell and frame and between adjoining frames on all sides.

The unique Midwest baffle-impingement principle makes these filters the most efficient air cleaners in existence. The filter medium consists of a series of specially shaped and perforated metal sheets coated with a sticky viscous fluid. Dusty air in passing through the filter cell, is forced to change its direction innumerable times.

Dust particles are impinged against the sticky surfaces of the filter sheets, where they are caught and held.

A series of specially designed sheets of knitted metal mesh are provided at the rear portion of the cell, on which fine dust particles which might pass the first filter sheets are impinged and caught.

Each cell holds a large amount of dust and does not clog up. A constant operating resistance of ½ water gauge is maintained by routine cleaning. One man on a small part of his time, takes care of the average installation.

Clean air is necessary in the modern bank building, not only as a matter of economy, but also for the maintenance of efficiency of personnel and the comfort of patrons.

The radical increase in the number of

MIDWEST AIR FILTERS

Installed in banks which took place in 1924, unmistakably shows that engineers and architects in every section of the country recognize the need for efficient air cleaning equipment in these buildings.

Like Midwest school installations for 1924, these banks are not confined to the large cities. New York, Detroit, Cleveland, Milwaukee, etc., were of course represented, but cities like Jamestown, N. Y., Peoria, Ill., Lowell, Mass., Uniontown, Pa., and Saginaw, Mich., were also included.

Existing bank buildings need clean air just as much as new ones. Midwest Air Filters can be economically installed in either new or old buildings.

Ask Dept. F 4 to send a Midwest Representative to discuss the advantages of Midwest Air Filters with reference to such bank jobs as you may have on hand, as well as to any other buildings with which you are concerned.

MIDWEST AIR FILTERS
INCORPORATED
100 EAST 45TH STREET
NEW YORK CITY

Midwest Canada, Ltd.
83 Craig St., West
Montreal, Canada

Midwest Air Filters Pacific, Inc.
953 Monadnock Building
San Francisco, California

Athey (Pat'd)

Cloth-Lined Metal Weatherstrip

3 times more efficient

Various scientific tests show that even ordinary metal weatherstrip shuts out about two-thirds of the air leakage around a window: *While Athey Cloth-Lined Metal Weatherstrip eliminates another two-thirds.*

Practically speaking the leakage of air or dust through Athey Cloth-Lined Metal Weatherstrip is nothing. *It is so infinitesimal that is shows only in laboratory tests.*

The secret of the greater efficiency of the Athey is the cloth to metal contact—a contact that "seals" the windows without making them hard to open or close. And the Athey is the *only cloth-lined metal weatherstrip made.*

That's why it is being used on many of the finest buildings of all kinds, all over the country.

The only weatherstrip that can be successfully applied to metal sash.

Even when the metal sash is not absolutely true, the cloth and spring bronze contact is sufficiently resilient so that perfect results are obtained.

Athey Products

SEE OUR CATALOGUE IN SWEETS

Perennial Window Shades, Cloth-Lined Metal Weatherstrips, Athey Disappearing Partitions Athey Skylight Shades

Write for complete information and prices

Athey Company

6027 West 65th Street · Chicago, Illinois

Heats 50% More Space with but Small Increase in Fuel with Wing Featherweight Unit Heaters.

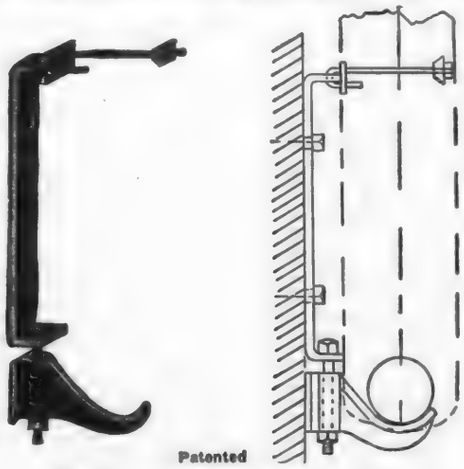
One of the largest manufacturers of synchronous motors and A.C. generators, in whose Minneapolis Erecting Shop several Wing Featherweight Unit Heaters were installed, write us as follows:

"As compared with last year, we are heating about 50% greater space with only a small increase in cost of fuel. The installation was very simple, the distribution of heat very satisfactory, and we shall be pleased to show this installation to any one interested."

The above proves most conclusively the economy of this new method of heating, and fully substantiates our claims of economy in directing the heat to the working level first and preventing the accumulation of heat under the cold roof.

L. J. Wing Mfg. Co.

Hudson & 13th Sts. New York City



Patented

No. 9 Bracket for Legless Column Radiation

All That A Radiator Bracket Should Be

Gleockle Radiator Brackets are designed and constructed by men who are thoroughly familiar with radiator bracket requirements. They are all that a radiator bracket should be. They are safe, convenient, durable, adjustable, easy to erect, inexpensive, invisible after erection and will fit any make of wall radiator.

Send for descriptive booklet and trade discount

FIT ANY MAKE OF RADIATOR

A. F. GLEOCKLE, Jr.

415 Bay Street, Rochester, N. Y.

What One Company Found Out About Ventilation—

OFTEN the importance of proper ventilation is under-estimated because those chiefly interested have no way of making direct comparisons between ventilated and unventilated buildings.

At the Warren, Ohio plant of the National Lamp Works, however, the management had an excellent opportunity to gauge the efficiency of their "Buffalo Forge" ventilating system.

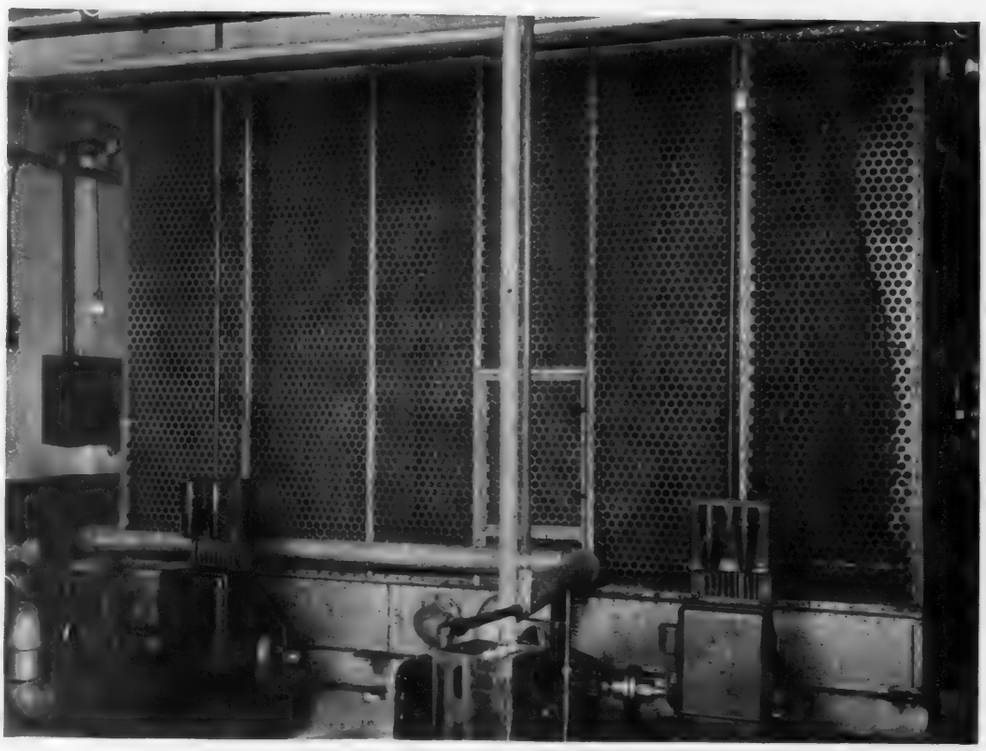
In 1920, the local public service company requested that they reduce power consumption; and the air conditioning apparatus was shut down for two weeks. Almost immediately they had complaints from persons all over the plant who had contracted colds and other throat troubles; while large cracks appeared in the work tables.

Putting the air washing apparatus into operation again immediately relieved the situation.

There is ample proof that production may be increased and working conditions improved in many of the more or less specialized industries. If you are confronted with a "ventilation" problem, why not let us help you?

Buffalo Forge Company

480 BROADWAY **BUFFALO, N. Y.**



Part of the equipment at one of the National Lamp Works' Factories.

12 Points in favor of Lyon Interlocking Heaters for Hot Blast Heating

Front view of Heater made up of 5 rows of 12 sections each, 70" on 5" centers, and containing 1050 sq. ft. of heating surface with 13.2 sq. ft. Free Area. Weight 5820 lbs.

Some Territory Still Open to Reliable Agents

—Guaranteed against cracked or broken sections under steam pressure up to 100 lbs.
—Light in weight, avoiding expensive foundations or supports.
—Made to fit in space of any height from 40 inches to 140 inches in steps of 10 inches, thus avoiding piling up or decking.
—Made in small units that can be assembled in the building, and handled through any window, door or small opening.
—Closely assembled, thus giving greater heating surface in smaller space.
—All prime heating surface with the resulting high efficiency.
—Admit steam at the top, the force of which drives the air down to the air vents at the bottom, thus assuring rapid and uniform circulation.
—Have all advantages of old style pipe heaters (in satisfactory use for forty years), with former objectionable features of bulk and weight removed.
—Made of full strength Spellerized pipe, virtually rust and corrosion proof.
—Headers and bases of semi-steel are pressed in by hydraulic pressure without threading—sections assembled with extra heavy right and left nipples.
—Designed for extreme conditions, such as 40° below zero intake temperature and velocity up to 2000 feet per minute, under which conditions of temperature, humidity and velocity, the condensation becomes excessive.
—Price compares favorably with that of other heaters, and their light weight saves on freight. Cost of installation also much less.

These heaters have been adopted and are being used by a number of the largest MANUFACTURERS of UNIT HEATERS throughout the country, also by some of the large fan manufacturers.

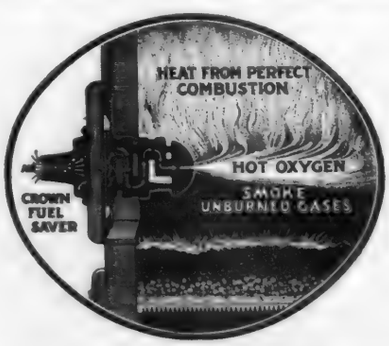
Valuable Data FREE Our 68 page catalog containing over 70,000 result figures of data on final temperatures and condensations from certain intake temperature and velocity, which cost over $2000 in cash and over 250,000 figures to compute, mailed free to Engineers, Architects and Contractors of record—write for it.

LYON PRODUCTS CO., Inc.
314-316 Union Park Court Chicago, Ill.

CROWN FUEL SAVER
and SMOKE *Consumer*

That the CROWN *does* save 20% or more of coal—gives more heat—practically eliminates black smoke—can easily be verified by any heating engineer who will make a test. For full details of this remarkable coal-saver and heat-producer, or for special demonstration price with money-back guarantee, write

CROWN FUEL SAVER CO., 70 N. 10th St., Richmond, Ind.

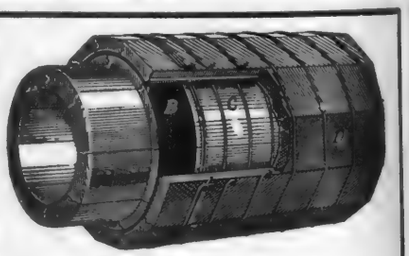


Fits the feed door of any heating plant, steam, warm air, hot-water

SAVES 20% OR MORE OF COAL

—AT LAST—
Home Study Courses
in
Heating and Ventilating Engineering
(By Mail)
Our Course HB
is devoted entirely to
Gravity Steam and Water Heating
Our Literature on Request
A-EM-DEE ENGINEERING COMPANY
Cousulting Engineers
3166 18th St., N.W. Washington, D. C.

Wyckoff's Improved Cypress Covering



Lasts as Long as The Pipe Itself

As well as being highly efficient in its application, Wyckoff Improved Cypress Steam Pipe Covering withstands all conditions attending steam pipe trenches. All engineers who know Wyckoff Pipe covering specify it because it lasts.

A. WYCKOFF & SON CO. ELMIRA, N. Y.

Chamberlin Passes 30 Year Test on This Detroit Office Building

"There is no question in our minds but what the Chamberlin equipment which was installed on the Equity Building in 1894, over 30 years ago has rendered most creditable service.

We do not hesitate to state that its efficiency is most excellent to this day. The installation has never caused any trouble whatsoever and, therefore, has certainly been a most profitable investment.

Your policy of making your own installation, and your consequent guarantee should, quite generally, insure results equal to those which we are experiencing."

EQUITY BUILDING
H. F. Reid. Manager
February 27, 1925

Equity Building, Detroit, equipped in 1894 with Chamberlin Metal Weather Strip

This advertisement is No. 1 of a series illustrating Chamberlin "Tests of Time".

Chamberlin Weather Strip Installed In 1894 Keeps Out 93.7% of Possible Leakage

The Equity Building, pioneer office structure of Detroit, was equipped with Chamberlin Metal Weather Strip in 1894.

On December 12, 1924, a test on windows of this building disclosed that the Chamberlin Weather Strip was still keeping out 93.7% of possible leakage as determined upon in tests made by the American Society of Heating and Ventilating Engineers.

At the time of test, a wind velocity of 18 miles per hour prevailed directly against the windows tested. These windows were not tightened, calked, or puttied, but were tested as they actually stood, after having been in use thirty years. In-leakage included the air that came through cracks in the frame and through the pulley holes.

This test is most significant as proof of actual value and efficiency, because it includes the time element—(in this case 30 years).

Architects, builders, and home owners are coming to know that weather strip is only as efficient as its installation. That is why *only Chamberlin experts trained perfectly in their work are allowed to fit and install Chamberlin weather strips.*

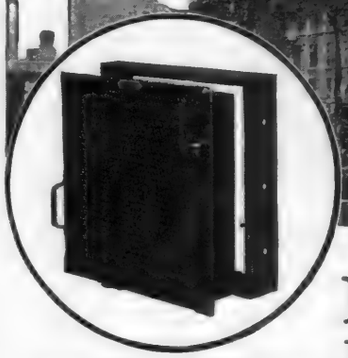
CHAMBERLIN METAL WEATHER STRIPS
SINCE 1893-THE STANDARD

The Chamberlin Company, itself, is behind every Chamberlin installation. In cases where occasional adjustments may arise, recourse is had directly to the company, an important advantage to both architect and builder.

CHAMBERLIN METAL WEATHER STRIP COMPANY, DETROIT, MICHIGAN

Sales and Service Branches in 80 Cities Throughout the United States

REED AIR IS CLEAN AIR



AMERICAN FURNITURE MART, CHICAGO, ILL.
Henry Raeder, Chicago, Architect. Associates, Geo. C. Nimmons & Co., N. Max Dunning, Chicago. James B. Lund, Engineer. Reed Air Filters installed by R. B. Hayward Co., Chicago.
(REED AIR FILTERS are covered by patents of May 16, 1922, Feb. 12, 1924, Nov. 18, 1924. Other patents pending.)

Largest Building in the World *Uses* REED CLEAN AIR

REED AIR FILTERS bring clean, healthful air to the American Furniture Mart club rooms which occupy an entire floor in the world's largest building. Just one more illustration of the flexibility of Reed Air Filters which are easily adapted to old or new systems and can be arranged to clean the air of an entire building, one floor or a single room. Complete data and sketches without cost.

REED AIR FILTER COMPANY, *Incorporated*
215 Central Avenue, Louisville, Ky.
Offices in Principal Cities

REED AIR FILTER COMPANY, Inc.
215 Central Avenue, Louisville, Ky.
Gentlemen: Please send me without obligation the following bulletins:
No. 106—The Reed System of Air Filtration
No. 107—Data, Tests and Specifications
No. 108—Reed Air Filters for General Ventilation
Possible Use..... C. F. M. Required
Name.....
Address.....
A

Reed Air
TRADE *filters* ALL METAL MARK

THE
PALMER HOUSE
HOTEL
CHICAGO

HOLABIRD
&
ROCHE
ARCHITECTS

Heating Contractor: PHILLIPS-GETSCHOW CO.
Plumbing Contractor: J. J. DALY

Higher First Cost of Powers Control Is Justified in the End

Systems of Automatic Temperature Control that need yearly adjustments and frequent repairs are not only annoying, but waste Fuel and cause much discomfort.

These troubles and the annual "SERVICE" bills, which so often come with lower *first-cost* systems of temperature control, will not be known by the owners of the new Palmer House. For in selecting Powers control for the Heating and Ventilating and Hot Water Service equipment of this splendid new building, the Architects have provided their clients with a system of control that will give many years of Accurate, DEPENDABLE service without repairs or adjustment.

THE POWERS
TYPE D THERMOSTAT

THE POWERS REGULATOR COMPANY

34 years of specialization in temperature control

2718 Greenview Avenue, Chicago

Atlanta	Charlotte, N. C.	Detroit	Los Angeles	New York	San Francisco	Seattle
Baltimore	Cincinnati	El Paso	Milwaukee	Philadelphia	CANADIAN OFFICES	
Boston	Cleveland	Houston	Minneapolis	Pittsburgh	Toronto	Winnipeg
Buffalo	Denver	Indianapolis	Nashville	Rochester	Montreal	Calgary
Butte, Mont.	Des Moines	Kansas City	New Orleans	St. Louis	Halifax	Vancouver

(3042)

Equipped With The NATIONAL SYSTEM

SIEMS-STEMBEL COMPANY
(2600 Como Ave., St. Paul—3200 Como Ave., Minneapolis)
ST. PAUL, MINN.

Jan. 6, 1921

N.W. Furnace & Supply Co.,
Minneapolis, Minn.

Gentlemen:

Answering your request, we will say that the heating plant you are installing in our Car repair shops, St. Paul, has, so for, fulfilled every requirement.

Up to the present time the coldest weather we have had has been 11 degrees below zero, but from the performance of the plant in that kind of weather, we feel fully convinced that it will heat the buildings to the required temperature 40 degrees, when the thermometer outside is 30 degrees below zero.

We would like to have you feel at liberty to send any prospective customers you may have who are comtemplating the erection of a similar class of buildings out to see the plant in operation.

We trust this is what you ask for,

and remain Yours very truly,

SIEMS-STEMBEL COMPANY

By C. H. Siems

President.

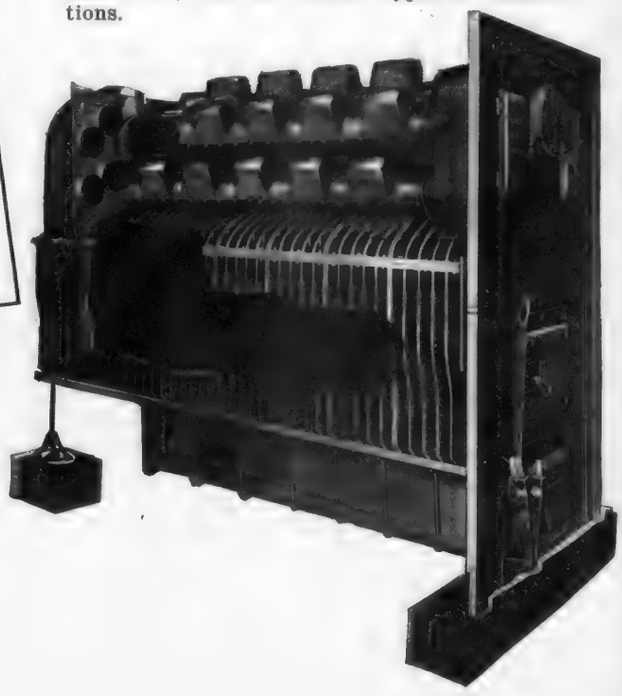
CS:D

The Best Proof is The Voice of a User

The above is a photograph of the Siems-Stembel Company's plant in St. Paul, successfully heated by the NATIONAL SYSTEM.

Mr. C. H. Siems, the President of the Company, in the accompanying letter says that requirements have been met in weather of 11 degrees below zero and is convinced that the same record would be maintained with the thermometer at 30 degrees below zero.

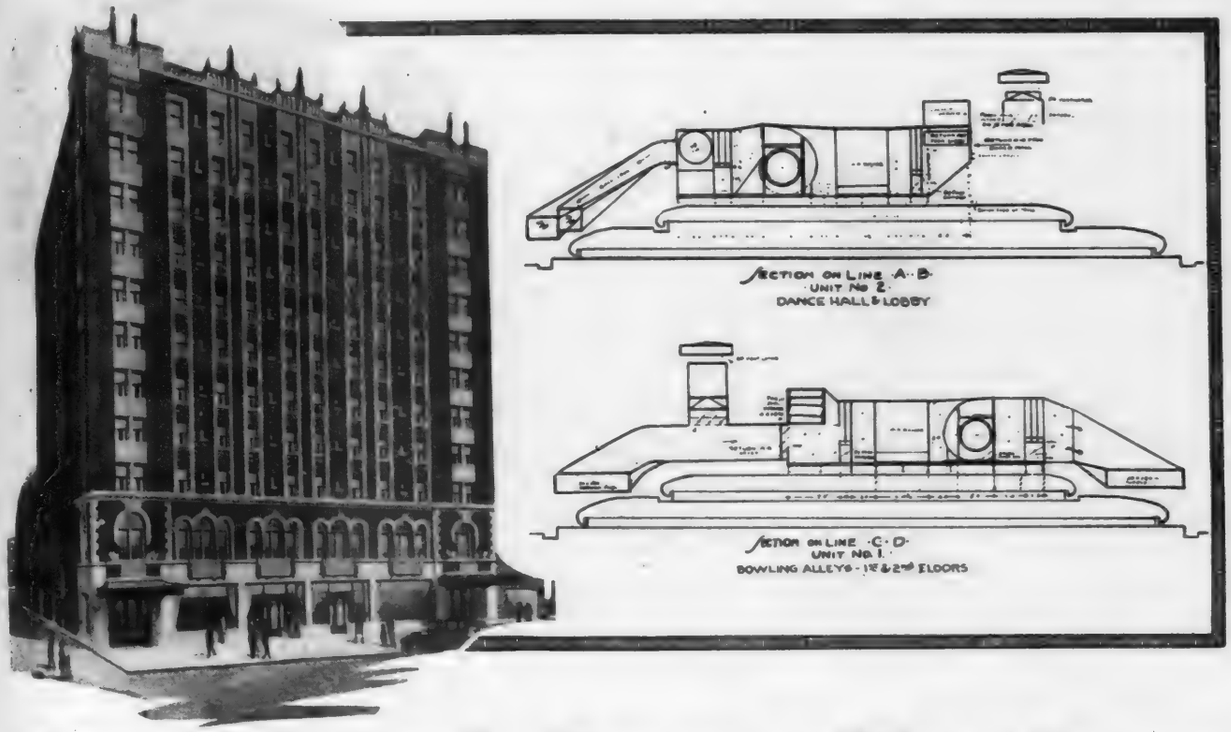
If you cannot take advantage of Mr. Siems' offer to have you visit his plant, let us send you full details regarding this installation, the efficiency of the NATIONAL SYSTEM OF HEATING, and the various types of installations.



P. H. MaGIRL

FOUNDRY AND FURNACE WORKS

BLOOMINGTON, ILL.



Unusual Installation to Save Costly Floor Space

IN the new Antlers Hotel and Recreation Building, Milwaukee, approximately one thousand square feet of income producing floor space is saved by placing the Bayley heating and ventilating units in what might have been waste space.

The two large supply units, each comprising a Bayley Plexiform Fan, Bayley Turbo Air Washer, and five Bayley Chinook Heater Coils, are mounted in the truss work supporting the Ball Room roof. From this point fresh, washed and humidified air, heated to the desired temperature, is supplied to the Hotel Lobbies, Restaurant, Bowling Alleys, Indoor Golf Course, and Ball Room. In addition to these two units, suspended in the attic space above the Ball Room, there is also a Bayley Plexiform exhaust fan, serving the kitchen and lobby areas, and a small Plexiform Fan with Chinook Heaters for supply to the basement.

Close co-operation of the architects and Bayley engineers produced this unique and effective installation and our staff is ready to extend a similar engineering service to architects and builders faced with heating and ventilating problems, simple or complex.

Send for Catalog No. 26 giving valuable data and capacity tables.

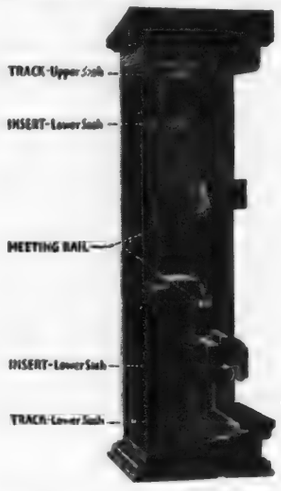
BAYLEY MANUFACTURING COMPANY, 732 Greenbush St., MILWAUKEE, WIS.

Bayley

AIR ENGINEERING & EQUIPMENT

HEATING AND VENTILATING
AIR WASHING AND HUMIDIFYING SYSTEMS
MILL EXHAUSTERS—PRESSURE BLOWERS
MECHANICAL DRAFT FANS
AIR AND GAS SCRUBBERS
INDUSTRIAL DRYING SYSTEMS

HIGGIN
ALL METAL
WEATHER STRIPS



The patent *Insert* strip makes Higgin Weatherstrips extra draft-tight

Higgin Weatherstrips are the only all-metal strips with the self-holding spring flange **Insert** in the sash. This **Insert** is important.

It makes a perfectly draft-tight contact at every point. Swelling or warping cannot prevent accurate fit and closure.

Without the Higgin Metal Insert the wooden groove will wear, swell or shrink, causing sticking or allowing seepage of air through the apertures.

Higgin Strips are "Metal against metal all the way round." Higgin-equipped windows and doors always keep cold air out and warm air in, operate smoothly and easily, and never need refitting.

HEATING ENGINEERS! You can safely guarantee a definite heating efficiency for your equipment when Higgin All-Metal Weatherstrips are installed. They keep all the cold air out and all the warm air in. They never loose their close fit by warping or shrinkage of frames. Every job is installed by trained Higgin men and guaranteed by the Higgin organization. Recommend Higgin All-Metal Weatherstrips to your customers.

The **HIGGIN** *Mfg. Co.*
Newport, Ky.
Toronto, Canada.
Manufacturers of Higgin All-Metal Weatherstrips and Higgin All-Metal Screens

WAYNE CROSS DRAFT
Magazine Feed Boiler
Burns Cheap Soft Coal—Lignite
Smokeless—Sootless

EASY To Clean **44 Inch Water Line** **EASY To Care For**

Some good territory open

WAYNE HEATER CORP.
Richmond, Indiana

Send for Catalog

AIR CONDITIONING TRADE MARK

APPARATUS for maintaining artificial atmospheric conditions in industrial plants.

ATMOSPHERIC CONDITIONING CORPORATION
LAFAYETTE BLDG.
PHILADELPHIA

For VENTILATION use LYON Toad Stools

They are Vent Caps of great strength, unobstructed throat, rigid non-rattling construction. The adjustment is from full open to full closed. The height of the floor member prevents sweeping dust and refuse into them. Their efficiency and economy make them particularly adaptable for theatres, auditoriums, etc.

Send for table of capacities and velocities
LYONS PRODUCTS COMPANY
710 Union Trust Bldg.
CHICAGO ILLINOIS

IT IS with considerable pride and satisfaction that we announce the successful application of polyphase alternating current motors to the Universal Unit Ventilation System, thus saving the initial cost of a motor generator set, maintenance of motor generator and increasing the electrical efficiency of the system from 20 to 45 per cent, depending upon the size of the installation. The loss of efficiency through the controversion of current from alternating to direct is thereby eliminated.

This big step forward in the field of Unit Ventilation, where Universal has always pioneered, has been made possible by a ***three point lead mounting.***

Our folder publication, No. 205, describing this application fully will be sent to you upon request.

JOHN J. NESBITT, INC.

"The Universal Unit Ventilation System"

213 NORTH VERMONT AVE., ATLANTIC CITY, N. J.

Branch Offices and Representatives

NEW YORK, N. Y. PORTLAND, ORE.
BALTIMORE, MD. SEATTLE, WASH.
DENVER, COL.

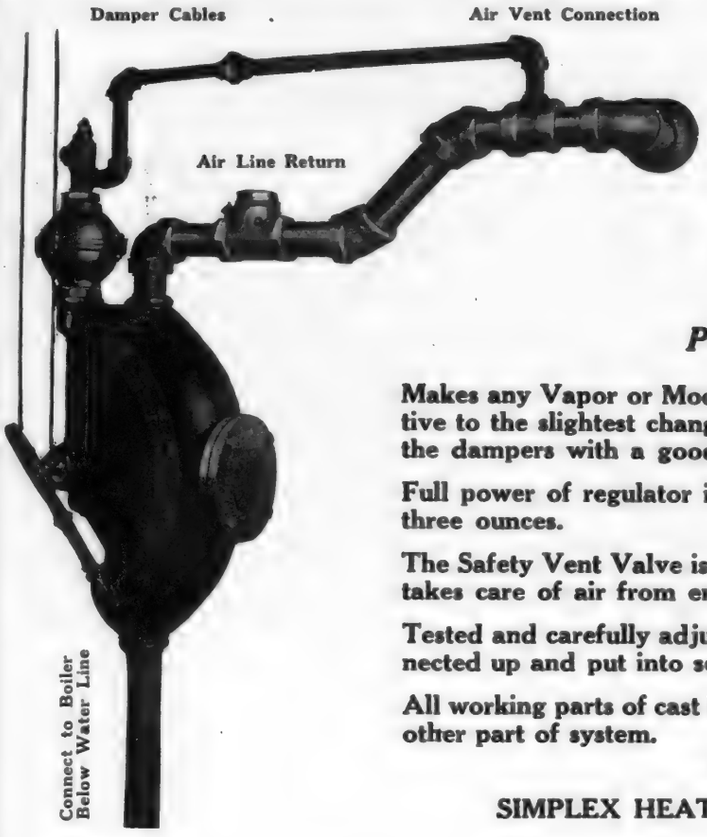
TEAR THIS OFF

Sign on the dotted lines and we will mail the booklet at once.

Name.....

Position.....

Address.....



Wiley

Safety-Vent Vapor Regulator

POWER IS ITS MIDDLE NAME

Makes any Vapor or Modulating System safe and satisfactory. Sensitive to the slightest change in pressure. Has ample power to control the dampers with a good working margin.

Full power of regulator is exerted within a pressure range of two or three ounces.

The Safety Vent Valve is a distinguishing feature of this regulator and takes care of air from entire heating system.

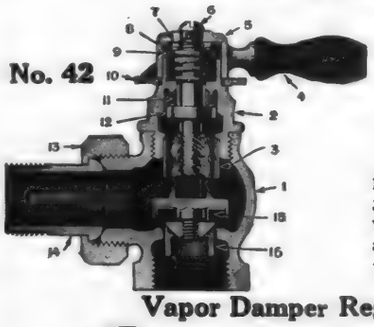
Tested and carefully adjusted before leaving factory, ready to be connected up and put into service, with the least trouble and expense.

All working parts of cast bronze. Will last as long as the boiler, or any other part of system.

Write for details

SIMPLEX HEATING SPECIALTY COMPANY, Inc.
LYNCHBURG, VA.

McALEAR SPECIALTIES FOR VAPOR HEATING SYSTEM

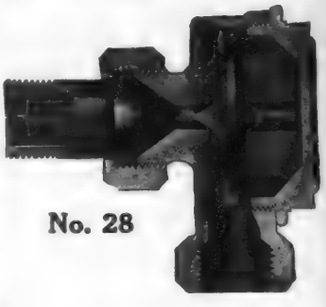


Packless Radiator Valves

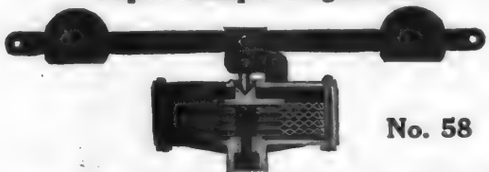
Quick-opening, nickel-plated brass body. Fig. 38, angle pattern, wood wheel handle; Fig. 42, angle pattern, graduating type, lever handle.

Radiator Traps

Discharge air and water in large quantities. Close tight against steam. Noiseless in operation. Nos. 28 and 28-A of steam metal, furnished N. P. unless otherwise specified. Nos. 28-A and 29-A have right and left-hand discharge openings. Nos. 29, 29-A, 33, 34 and 36 have iron bodies and brass caps, furnished plain unless otherwise specified.



Vapor Damper Regulators

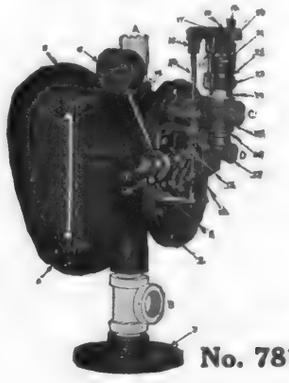


All metal, tapped for 1-inch steam pipe connection. Shipped complete with lever and two weights, S hooks, 2 ceiling pulleys and 12 feet of No. 10 plumbers' chain.

No. 56 for 0 to 3 pounds pressure, constructed with bellows of 10-inch flexible walls. No. 58 for 1 to 15 pounds pressure, constructed with bellows of 6-inch flexible walls.

Combination Float and Thermostatic Ball Check Valves

For venting supply and return mains of heating systems. These air valves close tight against water and steam, and by use of the check prevent the atmospheric pressure from entering the discharge opening.



Air Eliminator and Return Traps

For automatically returning the water of condensation direct to boiler and discharging air. Minimum distance between water line of boiler and bottom of trap should be 18 inches. "A"—inlet to trap; "B"—discharge to boiler; "C"—steam connection to boiler; "D"—air vent.

THE McALEAR MFG. CO.
1901-7 S. Western Ave.
CHICAGO, ILL.

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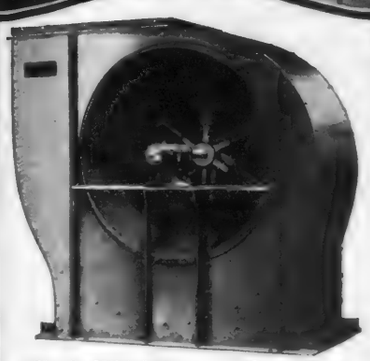

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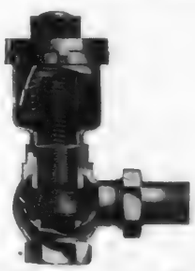

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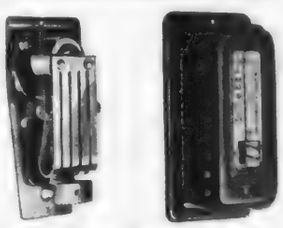

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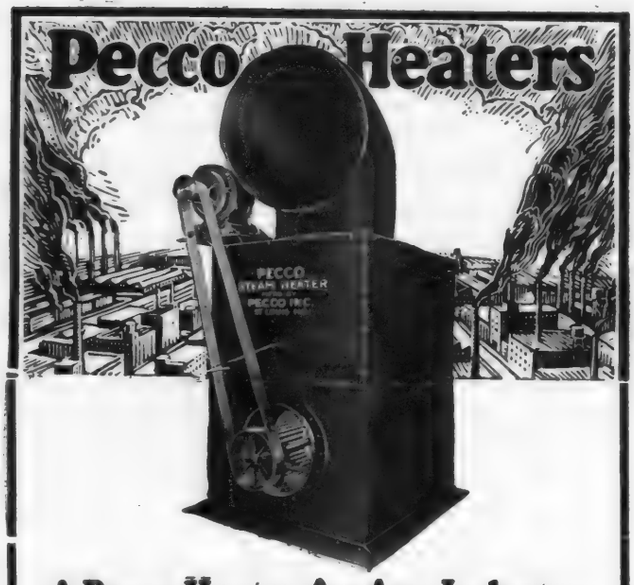

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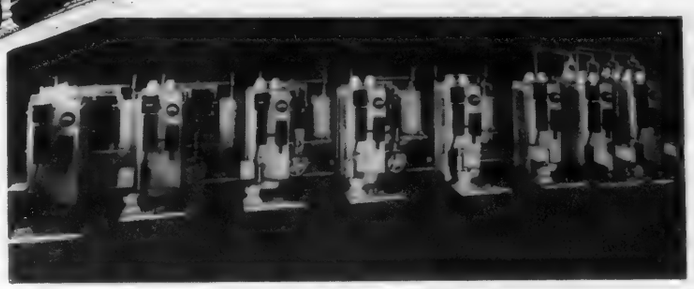

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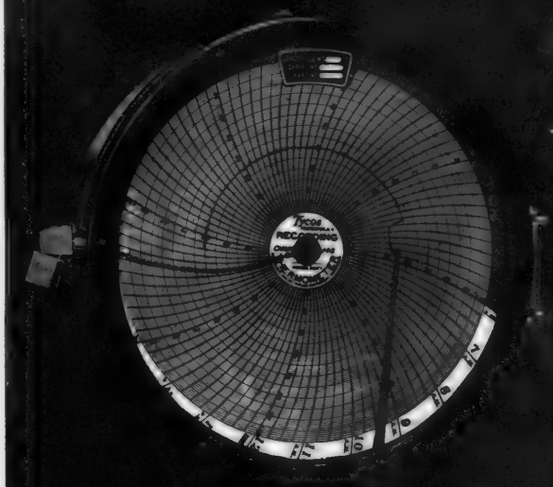

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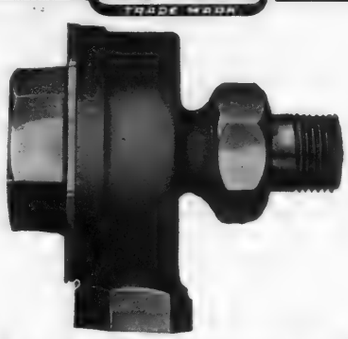

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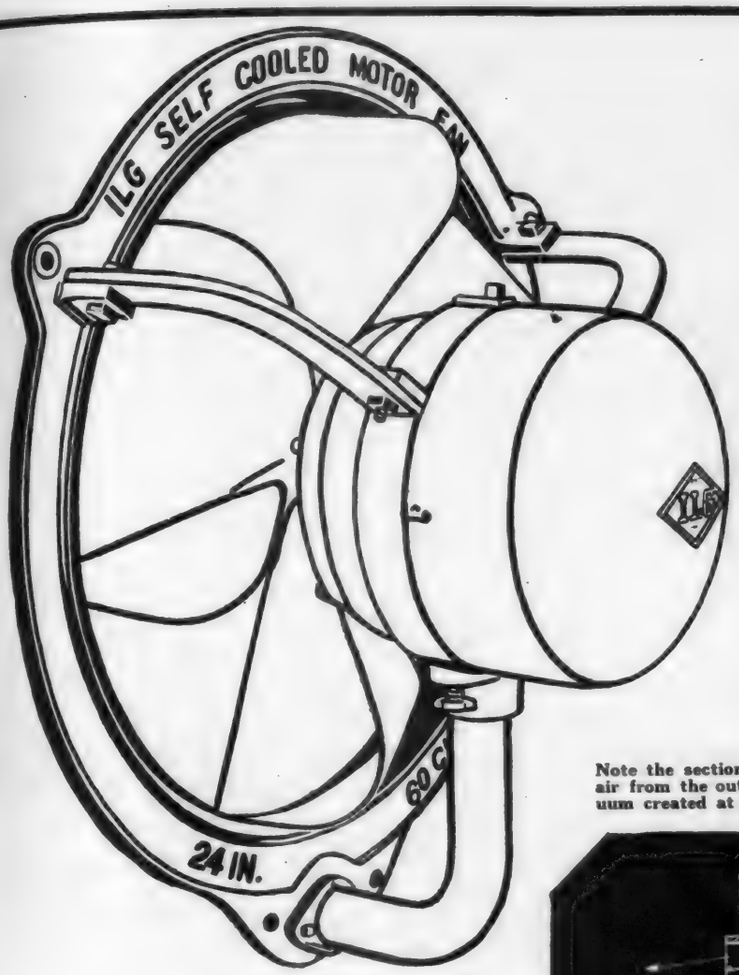

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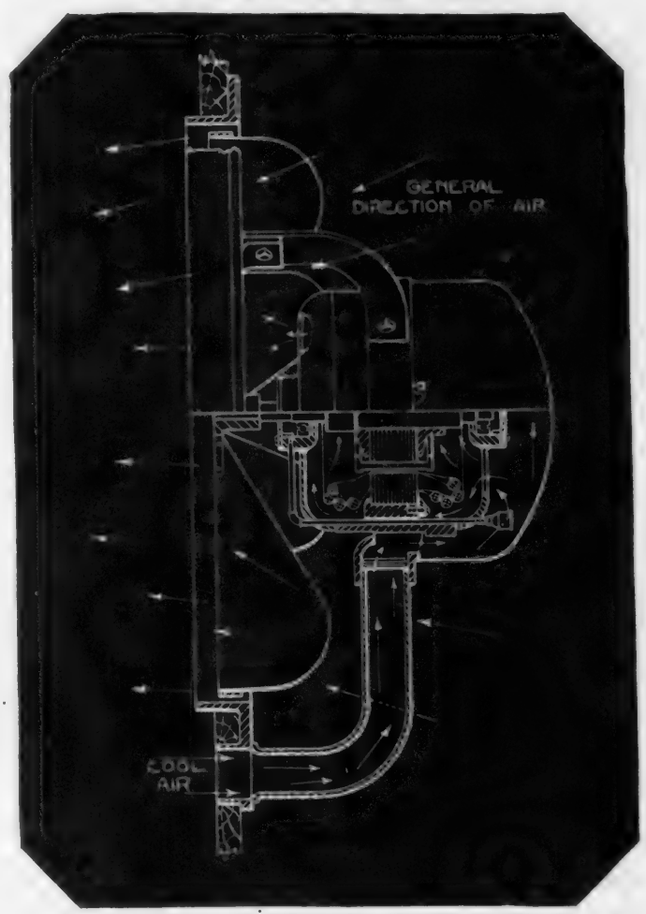

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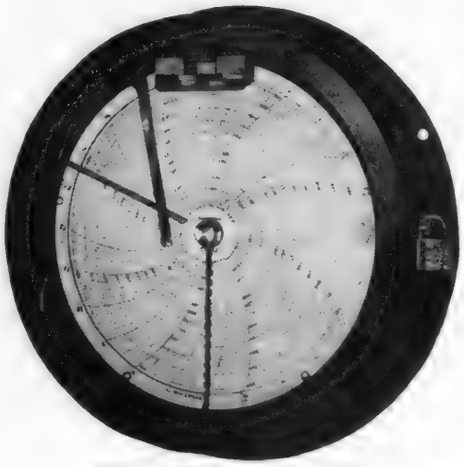

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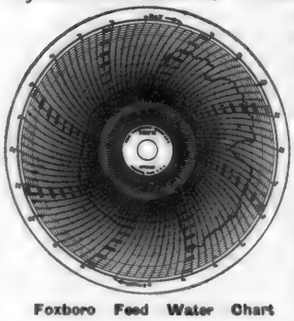

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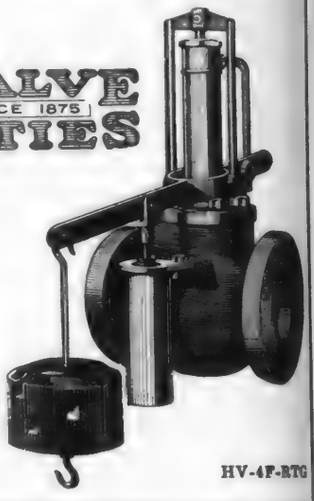

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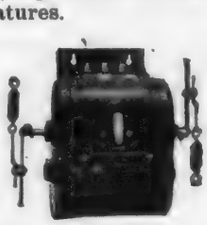
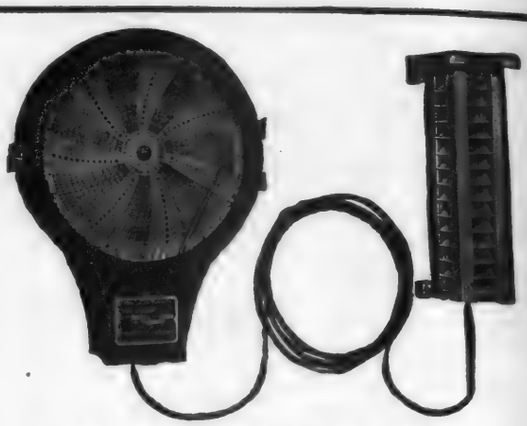


Write today for complete information

MINNEAPOLIS HEAT REGULATOR CO.
Established 1885
2804 Fourth Ave., So. Minneapolis, Minn.



BETTER RESULTS FROM HEATING AND VENTILATING SYSTEMS—

are induced by

TRADE MARK
BRISTOL'S
REG. U.S. PAT. OFFICE

Recording Instruments

The illustration above shows Recording Thermometer suitable for taking outdoor atmospheric temperatures. It is provided with a long flexible connecting tube so that the instrument can be installed indoors and the sensitive bulb in a weather-house outside.

This is particularly suitable for apartment houses, hotels, public buildings including schools, theaters, municiple, etc.

By knowing the outside temperature at all times the engineer is able to regulate the indoor temperatures more closely.

Ask for copy of Bulletin No. N-303.

THE BRISTOL COMPANY
Waterbury, Connecticut

Quick Delivery

NOW you no longer need to be handicapped by slow deliveries on thermometers. Increased manufacturing facilities have enabled us to lay in a stock of all standard types and ranges of Crescent Thermometers for every industrial purpose. They're all boxed and ready for shipment the day orders are received.

Crescent Thermometers have heavily lacquered, polished-brass "V" shaped case with removable glass front which permits of easy cleaning. The scale is also "V" shaped and graduated on both sides.

Large white enameled figures and graduating lines on the black dial, with a highly magnifying mercury tube, give maximum reading convenience. Made with 7", 9" and 12" scale; rigid union or separable-socket connections; straight or angle stem of any length. Bulb chamber of monel metal.

We have facilities for quickly repairing *all* makes of thermometers.

Ask for our 52-page Catalog F.

AMERICAN SCHAEFFER & BUDENBERG CORP.
BROOKLYN, N. Y.

*Boston Cleveland Pittsburg Salt Lake City
Buffalo Detroit Tulsa *Seattle
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*Stock carried at these branches

Direct Factory Representatives for Eastern Canada:
Mechanical Equipment Co.
902 New Birks Building, Montreal
For Western Canada:
Kipp-Kelly, Ltd., 68 Higgins Ave., Winnipeg

Crescent Thermometers

KENNEDY

Standard Globe, Angle and Cross Valves

Fig. 150

These valves are built with usual Kennedy carefulness. The design and construction are such as to insure perfect proportions, giving weight where weight is necessary for strength. All valves are thoroughly tested for strength and for perfect operation of parts before leaving the factory.
As in all the Kennedy products, only the best of materials are used. These valves are of bronze throughout, with stems of special bronze of 50,000 pounds tensile strength.
Listed in Catalog 45 with 4600 other different Kennedy Valve types and sizes. Send for a copy.

THE KENNEDY VALVE MFG. CO. ELMIRA, N.Y.

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BOSTON: 47 India St.
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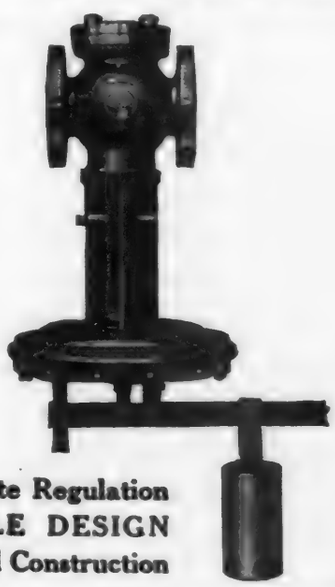
USE A MASON

Lever Style Reducing Valve
on your next
HEATING CONTRACT



Accurate Regulation
SIMPLE DESIGN
Rugged Construction

MASON REGULATOR COMPANY
Boston, Mass. San Francisco, Cal. Montreal, Canada

Equally Dependable

for STEAM, WATER, GAS, OIL or AIR

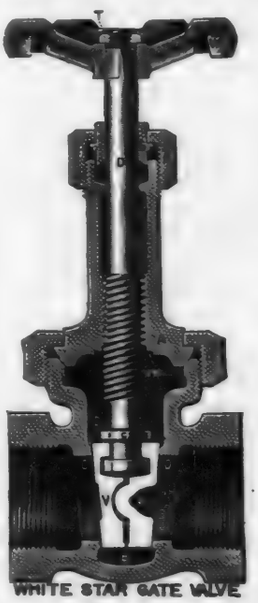


Fig. 375

POWELL White Star Gate Valves

DOUBLE WEDGE DISCS AND SEAT RINGS OF WHITE "POWELLIUM" NICKEL.

Steam Working Pressure up to 200 Pounds

Order from Your Dealer
Write us for information

THE WM. POWELL CO.
Dependable Engineering Appliances
CINCINNATI OHIO

"Keeping Others In Hot Water"—

for
Hotels, apartment buildings, hospitals, Y. M. C. A. buildings, schools and laundries

Special Attention Given to Installations Requiring Large Quantities of Hot Water, with Live or Exhaust Steam as the Heating Medium.

—may be a pastime for some folks, but for the Sims Company it is a serious proposition—a matter requiring a thorough knowledge of hot water requirements.

A long study of these requirements enables us to offer heaters that assure constant and efficient hot water service.

Engineers feel safe in specifying "SIMS" because they know it means **reliability**—a service you want to render your client.

SIMS CLEAN E-Z STEAM TUBE STORAGE HEATER

Our Engineers will gladly confer with you, without obligation, on your hot water problems.

THE SIMS CO.

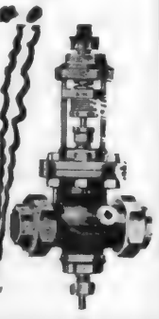
Erie, Pa.

A good place to live, to work and to play.

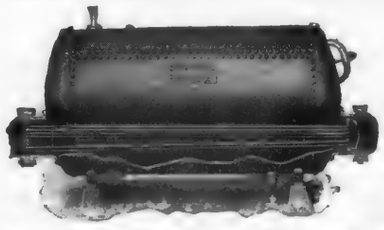
If it's a REGULATING VALVE
WE MAKE IT !!

- Reducing Valves
- Temperature Regulators
- Pump Governors
- Balanced Valves
- Damper Regulators
- Float Valves
- Swing Joint Fittings
- Bronze Unions
- Thermostats

Write your name and address on the margin of this page, mail to us, and we will send complete information.



ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE
281 South St. NEWARK, N. J.



Alberger-Buffalo Storage Heaters have tubes the full length of tank which insures maximum heat transfer. Satisfaction guaranteed. Write for information on Alberger Multi Head Heaters and Howard Guided Expansion Joints.

ALBERGER HEATER COMPANY
HOWARD IRON WORKS
281-289 Chicago St. Buffalo, N. Y.

Wainwright low pressure or turbine expansion joint.

The Wainwright Low Pressure Expansion Joint

AT low pressure this light weight copper expansion joint provides the most simple and inexpensive means for compensating for pipe expansion. Multiple corrugations make it more flexible and longer lived than the "coppersmith" type of joint with a single corrugation. The Wainwright Joint is absolutely steam or liquid tight, there is no packing to be replaced, and it requires no attention. For use in water or high velocity steam lines it may be supplied with an internal protecting sleeve to prevent erosion of the copper expansion member and to reduce friction.

For high pressure service, the Wheeler Condenser & Engineering Co., also manufactures the Wainwright Improved Expansion Joint with Internal and external equalizing rings.

Wainwright anchors and guides form the most efficient means of fastening pipe lines.

Write for Bulletin H 46.

WHEELER CONDENSER & ENGINEERING COMPANY

Works, Carteret, N. J. and Newburgh, N. Y. Main Office, 149 Broadway, New York

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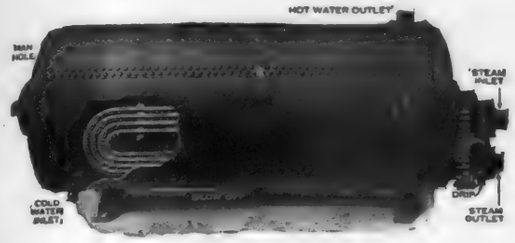


Patterson Combined Hot Water Service and Storage Heater—Type B.

Ready for Sudden Heavy Demands

This heater is adaptable to:

- Clubs
- Hotels
- Apartment Houses
- Association Buildings
- Institutions
- Bleacheries
- Dye Houses
- Canning Plants
- Laundries
- Paper and Pulp Mills
- Textile Plants
- Industrial Plants, etc.

Where the demands for hot water are not constant or where a large volume of water must be held in storage for sudden, heavy demands, the Patterson Combined Hot Water Service and Storage Heater fills the requirements. It operates with either live or exhaust steam—high or low pressure—automatically controlled, or in connection with low pressure, vacuum or vapor heating systems.

Our Engineering Service is offered without obligation, and the requirements of each installation are considered carefully before making recommendation as to type or capacity of the heater to be used.

Where installations are made in accordance with our recommendations, we positively guarantee satisfactory hot water service.

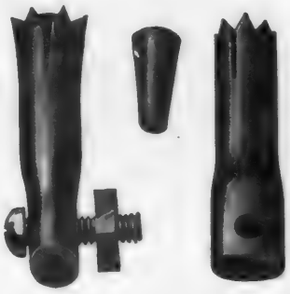
Patterson-Kelley Co.,

Water Heating Engineers

107 E. 40th St. **New York**

For Fastening Pipe Hangers to Concrete Ceilings

Phillips Self-Drilling Shells



Quick—Economical—Permanent

Phillips Spring Hammer

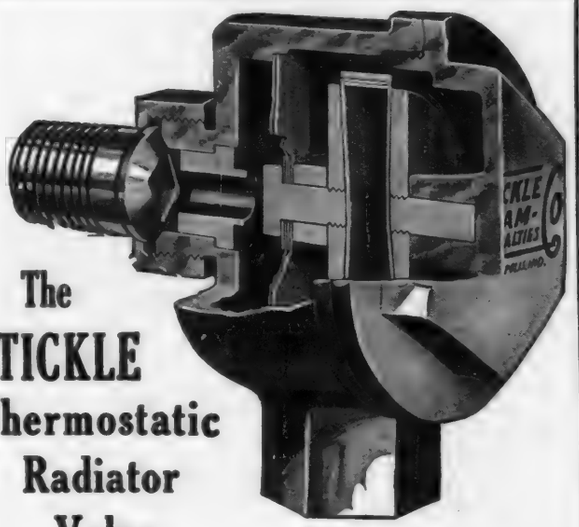
The shell is drilled in to the proper depth by a few blows of the Phillips Spring Hammer. It is then removed and tapered expander inserted in end of the shell. Shell with expander then replaced and driven permanently into place by a few more blows of the hammer.

Quick, permanent and most economical fastening for pipe hangers, etc.

Write for full particulars today

Phillips Drill Company

1537 Cortland St., Chicago, Ill.



The STICKLE Thermostatic Radiator Valve

The Expansion principle in return line Radiator Traps is not novel or new. Consequently the difference in this class of Traps is in the construction.

The expansive movement of this diaphragm is fully one-quarter inch, which is much more than is necessary for opening and closing the valve. This gives a factor of safety which is greater than any valve made, consequently it requires no adjustment. May we send you our bulletin?

STICKLE STEAM SPECIALTIES CO.

INDIANAPOLIS, IND.

New York Office 46 E. 41st St.

Boston Office 52 Sudbury St.

Easy to Sell to Oil Burner Users ~~~

"Clean Up" on this clean-up campaign!

Wherever you sold an oil burner you started a clean-up campaign. You showed home owners how they could get rid of ashes, dirt and soot—how they could have a clean, neat basement.

Now go a step further. Show oil burner users how they can eliminate the unsightly rubbish barrel from the basement, the filthy garbage can from the back yard. Home Incinerator and oil burner advantages are so closely allied that the one naturally follows the sale of the other.

The Home Gas Incinerator is ingeniously constructed so it dries out the garbage, then burns it completely. 2¾ bushels reduced to a pint of ashes without smoke or odor. Convenient elbow height. Feeds through large opening in the top. Lights at the push of a button. Dumps the ashes at the pull of a lever. Deep, galvanized ash bucket. Simple and economical to operate. *Needs no servicing*—you make a clear profit. There is money for you in the Home Gas Incinerator. None can compare with it. Send today for complete information.

HOME INCINERATOR COMPANY
209 Grand Ave., Milwaukee, Wis.

The Home IncineratoR

Buy Direct and get in on a very Profitable Field

You Can Now Buy C. S. B. APPROVED SPRINKLER HEADS

direct from us, either separately or together with all the other necessary equipment for sprinkler systems. There is a profitable field in your vicinity and you do not have to let this go by any longer. Use your own pipe and men and make your own price.

Sprinkler heads must be replaced after a fire. Keep a stock on hand for this demand.

Write for prices. We cooperate with you in every way.

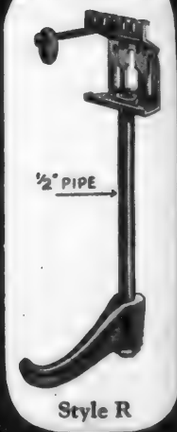
C. S. B. SPRINKLER COMPANY
54 Batterymarch Street Boston, Mass.
Factory: Laconia, New Hampshire
Canadian Representatives: L. E. Moulton Co., Inc., 142 Inspector Street, Montreal, Canada

E-Z RADIATOR HANGER
YOU'LL USE 'EM YET!

E-Z HANGERS are adapted to ANY wall construction and fit ANY style of radiator.

Write for ALL the advantages.

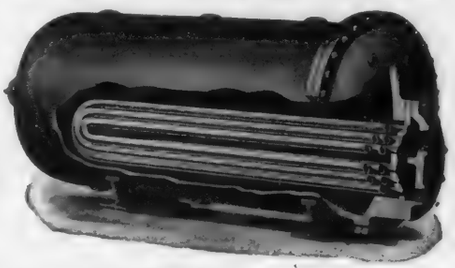
HEALY-RUFF CO.
772 Hampden Ave.,
St. Paul - - Minn.



Style R

"I'll let you in on the secret"

"The chief reason I've got a reputation for heating jobs is that I'm mighty particular what kind of equipment is put in. That's why I always specify **National** U-Bend Storage Heaters for hot water service. They use live or exhaust steam, which saves coal, and they're dependable and cost least for maintenance. National Storage Heaters are mighty good props for any heating engineer's reputation."



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NATIONAL
U BEND TYPE
STORAGE HEATERS

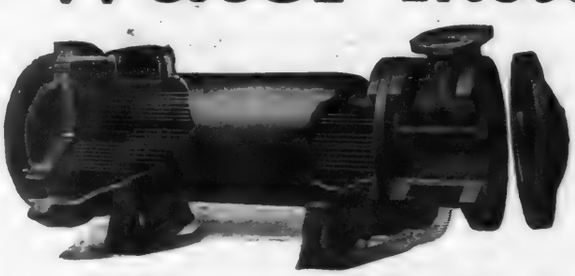
The National Pipe Bending Company

120 RIVER STREET *Established 1883* NEW HAVEN, CONN.

Canadian Sales Representative: Grant E. Cole Company, Toronto, Ont. 7866

Hot Water *Instantly*

Any quantity, any temperature



For Hotels, Apartments, Laundries, etc.

G-R Instantaneous Heater

for any given pressure drop, has a higher rate of heat transfer than any other closed water heater on the market.

Overload capacities possible with only slight reduction in final water temperature.

Minimum external dimensions for any desired rating.

The Griscom-Russell Co.

2155 West Street Building, New York

Philadelphia	Chicago	St. Louis	San Francisco
Boston	Detroit	Kansas City	Los Angeles
Rochester	Cleveland	New Orleans	Seattle
Pittsburgh	Indianapolis	Charlotte	Salt Lake City
Columbus	Milwaukee	Houston	Denver
	Minneapolis	Dallas	

For Canada: Riley Engineering & Supply Co., Ltd., Toronto

Send the Coupon for full information

THE GRISCOM-RUSSELL CO.,
2155 West Street Bldg., New York City.
Gentlemen:
Please forward immediately a free copy of your information leaflet on the G. R. Instantaneous Heater.
Name.....
Firm.....
Address.....
H&V 4-25

3088

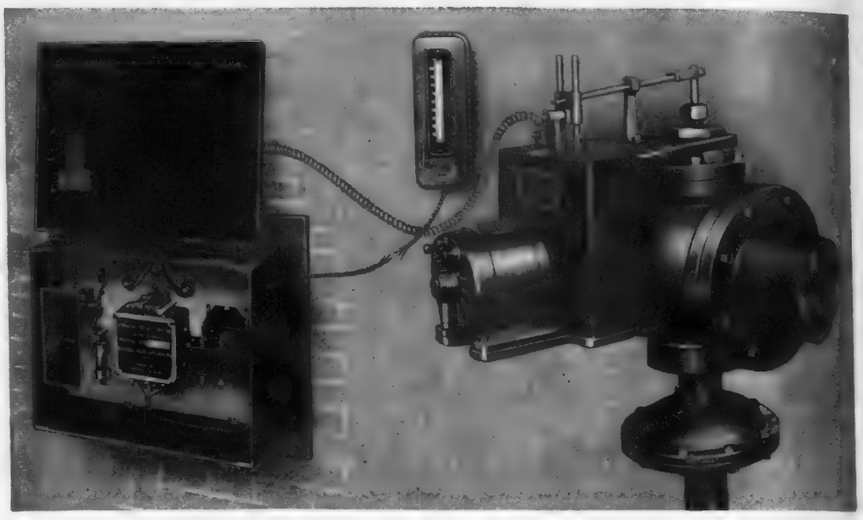
A Shilling Saved is a Shilling Earned

This old economical principle applied to a new situation works just as well as of old. 30% saved in using the 2 in 1 Hornung Pressure and Temperature "Master Control" is 30% earned, and is well worth consideration for any large user of Central Heat.

Hornung "Master Control" valves show savings as high as 65% or more, and it will be a pleasure to analyze your situation to see if a saving can be earned for you—without any obligation on your part.

Wouldn't you like to see some letters from actual users proving, without doubt, enormous savings?

CENTRAL HEAT APPLIANCES
J. C. Hornung, Engineer
243 S. Dearborn St. Chicago



Over 100 of these 2 in 1 Valves in one Minnesota town.

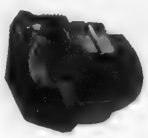
VAPOR-VACUUM
STAY-RITE
SPECIALTIES

Stay-Rite All-Metal Radiator Traps and Valves are a good proposition for Jobbers, Contractor and user alike, because they are simple, profitable and sure.

Write to day for literature and prices.

THE IDEAL HEATING EQUIPMENT CO.
1250 WEST 4TH ST.
CLEVELAND, OHIO

Wonderful Savings in the Cost of Heating are made with Metering Radiator Bushings



Patent Allowed

Let us tell you about the savings the users of this simple device are obtaining.

Used to decided advantage on any return line or vacuum installation. Equally good for correcting installed plants as for plants being installed. A wonderful device for reconstructing extravagant plants at a price that will get the job.

Write for circulars

They are placed in supply end and proportion the steam to each radiator as required.

THE HOLLEY ENGINEERING COMPANY
VIRGINIA, MINN.

KIELEY
REGISTERED TRADE MARK

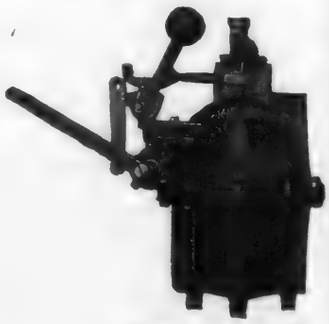
Steam, Water and Air Specialties

Non-Return, Easy Repair Trap

Manufacturers of the Complete Line

Send for Catalog 1923

KIELEY & MUELLER, Inc.
Main Office and Works
34-38 West Thirteenth Street
New York, N. Y.



Pump and Lift Trap

A Few Users of RIC-WIL:

Diamond Alkali Co., Pittsburgh, Pa.
Campbell Soup Co., Camden, N. J.
U. S. Government, Public Health Hospital No. 32, Washington, D. C.
Byron Sanitorium, London, Ont.

Showing how easily Ric-wiL Base Drain is installed. Grade the trench and set the drain in place. Note the slots by which the bells of the conduit interlock compactly with the base drain.

Permanently Water-tight

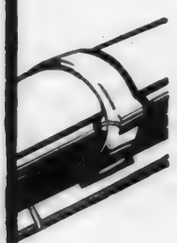
BETTER any old insulation in a dry conduit than the finest insulation in a wet conduit. For no insulation can be or remain efficient if it is not dry.

So first of all Ric-wiL is made water-tight. Its extra wide side joints and bells allow perfect sealing and by their unusual interlocking strength prevent the opening up of cracks. And Ric-wiL Base Drain, close under the conduit, carries all moisture away immediately. A dry conduit in a dry ditch!

Add to this dryness Ric-wiL insulation of proved high efficiency, and it is evident why Ric-wiL is a profitable investment in heat transmission—the 1st month and the 150th as well.

Specify Ric-wiL—sound underground conduit investment for your clients.

THE RIC-WIL COMPANY, CLEVELAND, OHIO

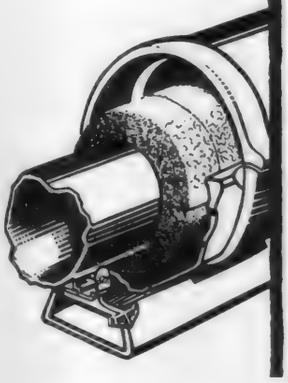


RIC-WIL Economies No. 2

Ric-wiL Underground Conduit is installed comfortably in a narrow trench. Because of its construction very little extra room is needed in getting it and the pipes it insulates into place. Normal width of Ric-wiL trench is 18 inches wider than the conduit size.

Further, it requires no sub-trench. For Ric-wiL Base Drain is set on the floor of the main trench.

These two items have been known to save as much as 150 cubic yards of excavation on a 1000 foot job, a saving often of vital importance to a contractor.



RIC-WIL
UNDERGROUND CONDUIT

Now Ready—

Complete 1924 Issue of The Heating and Ventilating Magazine

In Bound Volume

Here is an opportunity to secure the entire issue of Heating and Ventilating Magazine for the year 1924, in convenient form. Bound in one volume, with cross index.

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HEATING CAPACITY
Steam—3300 Sq. Ft. to 25,000 Sq. Ft.
Water—5200 Sq. Ft. to 40,000 Sq. Ft.

NO MUD LEGS OR STAYBOLTS
LOW STACK TEMPERATURES
LOW WATER LEVEL—RAPID CIRCULATION

The Stanwood Corporation
CINCINNATI, OHIO
Successor to
THE HOUSTON STANWOOD & GAMBLE CO.

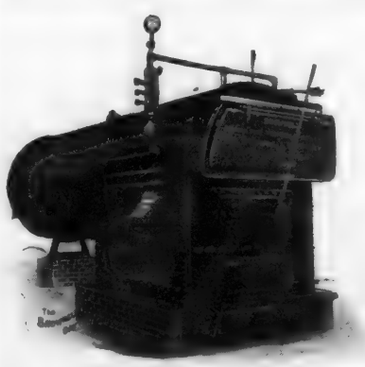
Do You Still Use Large Domestic Coal?

Why not economize by using Buckwheat Coal—at about half the price of domestic coal.

You can burn Buckwheat with PYRAMID GRATES

Let Us Send Full Details

PYRAMID IRON PRODUCTS CO.
136 Liberty Street **New York City**



Brownell Return Flue Portable Heating Boiler—Smokeless Type

BROWNELL

Better Boilers for Heating and Power Purposes
70TH YEAR

of successful manufacturing experience. This is the reason why Brownell Boilers are specified by all the leading Heating and Contracting Engineers.

BROWNELL Steel Heating Boilers are
LOW IN FIRST COST
HIGH IN EFFICIENCY
BUILT TO LAST A LIFETIME

Our reputation is your insurance of a high quality product. Let us solve your heating problems. Sales representatives in all principal cities. Send for them.

THE BROWNELL CO.
DAYTON, OHIO

Established 1855

Send for Bulletins
B6 B6A

BOILERS

BADGER

Permanency

A big factor in economy lies in the amount of attention required by an installation after it has been made.

BADGER SELF-EQUALIZING EXPANSION JOINTS are economical because they make a permanent job. A one-piece joint, easily bolted in place, no packing or adjusting to be made, possibility of leaks eliminated—no further attention.

Engineers who know BADGER EXPANSION JOINTS feel safe in recommending them because, in addition to quality, they are sure of an efficient engineering service in selecting the right joint for each BADGER installation.

Eighty-three years in the manufacture of metal specialties enables us to offer this service, and without obligation. Let our engineers help you.

E. B. BADGER & SONS COMPANY

75 PITTS STREET, BOSTON, U. S. A.

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Buckeye Blower Co., Columbus, O.
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Carrier Engineering Corporation, Newark, N.J.
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Buffalo Forge Co., Buffalo, N. Y.
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Clarage Fan Co., Kalamazoo, Mich.
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AIR FILTERS.
Midwest Air Filters, Inc., New York.
Reed Air Filter Co., Inc., Louisville, Ky.

AIR SEPARATORS.
Griscom-Russell Co., New York.
Hoffman Specialty Co., New York.

AIR WASHERS.
American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Mfg. Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Cooling Tower Co., Inc., New York.
Fleisher Co., Inc., W. L. New York.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Sturtevant Co., B. F., Hyde Park, Mass.

BLOWERS
Fan.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

Pressure.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

Rotary.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

Turbine.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

BOILER CEMENT.
Johns-Manville, Inc., New York.

BOILERS.
Down-Draft.
American Radiator Co., Chicago, Ill.
Brownell Co., The, Dayton, O.
General Boilers Co., Waukegan, Ill.
Hart and Crouse, Utica, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
Kewanee Boiler Co., Kewanee, Ill.
Molby Boiler Co., New York.
Oil City Boiler Works, Oil City, Pa.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Co., New York.
Richmond Radiator Co., New York.
Stanwood Corporation, Cincinnati, Ohio.
Universal Smokeless Boiler Co., Ravenna, O.

Heating.
American Radiator Co., Chicago, Ill.
Brownell Co., The, Dayton, O.
Bryant Heater & Mfg. Co., Cleveland, Ohio.
Continental Heater Corp., Dunkirk, N. Y.
Cox Stove Co., Abram, Philadelphia, Pa.
General Boilers Co., Waukegan, Ill.
Gorton & Lidgerwood Co., New York.
Grinnell Company, Providence, R. I.
Gurney Heater Mfg. Co., Boston, Mass.
Handon Boiler Corp., New York.
Heggie Simplex Boiler Co., Boston, Mass.
Illinois Malleable Iron Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Kewanee Boiler Co., Kewanee, Ill.
Molby Boiler Co., New York.
Newport Boiler Co., Chicago, Ill.
Niagara Radiator & Boiler Co., North Tonawanda, N. Y.
Oil City Boiler Works, Oil City, Pa.
Page Boiler Co., Wm. H., New York
Pierce, Butler & Pierce Mfg. Co., New York.
Richmond Radiator Co., New York.
Ross Boiler Co., Chicago, Ill.
Stanwood Corporation, Cincinnati, Ohio.
Thatcher Furnace Co., Newark, N. J.
Titusville Iron Works, Titusville, Pa.
Utica Heater Co., Utica, N. Y.
Wayne Heater Corp., Richmond, Ind.
Weil-McLain Co., Chicago, Ill.

Power.
Heggie Simplex Boiler Co., Joliet, Ill.
Kewanee Boiler Co., Kewanee, Ill.
Oil City Boiler Works, Oil City, Pa.
Ross Boiler Co., Chicago, Ill.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., Titusville, Pa.

CALORIMETERS.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Sarco Co., New York.

COILS, PIPE.
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Simmons Co., John, New York.

Air.
New York Blower Co., Chicago, Ill.

CONDENSERS.
Alberger Heater Co., Buffalo, N. Y.
American Radiator Co., Chicago, Ill.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Elliott Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Whitlock Coil Pipe Co., Hartford, Conn.

CONVERTERS, HOT WATER.
Alberger Heater Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co. Inc., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.
Wyckoff & Son Co., A., Elmira, N. Y.

COOLERS.
Oil.
Alberger Heater Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLING TOWERS.
Badger & Sons Co., E. B., Boston, Mass.
Cooling Tower Co., Inc., New York.

COPPER BOILERS.
Dahlquist Mfg. Co., Boston, Mass.

COPPER KETTLES.
Dahlquist Mfg. Co., Boston, Mass.

COVERING PIPE.
American District Steam Co., No. Tonawanda, N. Y.
Hornung, J. C., Chicago, Ill.
Johns-Manville Inc., New York.
Ric-Wil Co., Cleveland, O.
Wyckoff & Son Co., A, Elmira, N. Y.

DAMPERS, DUCT.
American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.

DEHUMIDIFYING APPARATUS.
American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Engineering Corp., Newark, N. J.
Fleisher Co., Inc., W. L., New York.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

DISTILLERS, (Water).
Badger & Sons Co., E. B., Boston, Mass.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co. Inc., Buffalo, N. Y.

DRAFT APPLIANCES.
Combustion Specialties, New York.
Crown Fuel Saver Co., Richmond, Ind.
Simmons Co., John, New York.
Wolff Coal Saver Co., Chicago, Ill.

DRYING SYSTEMS.
(See Air Cooling and Drying Systems.)

DUST COLLECTING SYSTEMS.
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, New York.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.

DUST COLLECTORS.
American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Co., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F. Hyde Park, Mass.

DUST DETERMINATORS.
Atmospheric Conditioning Corp., Phila., Pa.
Hill, E. Vernon Co., Chicago, Ill.

ENGINES.
Steam, Automatic.
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, O.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Stanwood Corporation, Cincinnati, Ohio.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

Steam, High Speed.
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, O.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.
Sturtevant Co., B. F., Hyde Park, Mass.

EQUALIZING LOOPS.
Hoffman Specialty Co., New York.

EVAPORATORS.
Boiler Feed Make-Up.
Badger & Sons Co., E. B., Boston, Mass.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

EXHAUST SYSTEMS.
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Ilg Electric Ventilating Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Wing Mfg. Co., L. J., New York.

EXHAUST HEADS.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Simmons Co., John, New York.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Wright-Austin Co., Detroit, Mich.

Ample Air and Water Capacity

YOUNG VACUUM PUMPS

THE Young Centrifugal Vacuum and Boiler Feed Pumps have an ample capacity for air and water. In fact, they are sold under a guarantee to produce ten inches of vacuum with a return temperature of water not to exceed 180 degrees in a properly laid out and equipped vacuum system, and to handle with entire adequacy the air and water called for by their rated capacity. They have a peak load capacity equal to **four times** normal demand.

There are many strong points of particular merit in connection with Young Pumps other than this feature of ample air and water capacity. These pumps are extremely simple in operation. They also are economical in power consumption to a marked degree. Their construction makes them ideal from the cost of maintenance standpoint, as but few moving parts are used in their construction, and these are remarkably sturdy and long lived.

YOUNG PUMP COMPANY **230 East Ohio Street, Chicago**

Factory: Michigan City, Indiana

Young Centrifugal Vacuum and Boiler Feed Pumps

THIS illustration shows the assembled unit on substantial base, ready for shipment from the factory. Careful inspection and thorough testing assures the satisfaction which we guarantee. Various types of automatic control are furnished to meet the requirements of the particular installation, as explained in our Bulletin.

ENGINEERS' SPECIFICATION INDEX (Continued)

EXPANSION JOINTS.

American District Steam Co., No. Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Central Station Steam Co., Detroit, Mich.
Dahlquist Mfg. Co., Boston, Mass.
Griscom-Russell Co., New York.
Hornung, J. C., Chicago, Ill.
Howard Iron Works, Buffalo, N. Y.
Illinois Engineering Co., Chicago, Ill.
Ric-Wil Co., Cleveland, O.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Webster & Co., Warren, Camden, N. J.
Wheeler Condenser & Engineering Co., Carteret, N. J.

EXPANSION SHELLS

Phillips Drill Co., Chicago, Ill.

FANS, EXHAUST.

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.

FEEDERS

Boiler

Kieley & Mueller, Inc., New York.
McDonnell & Miller, Chicago, Ill.
Taylor Machine Works, Battle Creek, Mich.

FILTERS, (Aerating).

Griscom-Russell Co., New York.

Feed-Water.

Elliot Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.

FITTINGS, FLANGED.

American District Steam Co., No. Tonawanda, N. Y.
Clow and Sons, Jas. B., Chicago, Ill.
Grinnell Company, Providence, R. I.
Simmons Co., John, New York.

FLANGES.

American District Steam Co., No. Tonawanda, N. Y.
Jenkins Bros., New York.

FLOOR SLEEVES.

Farley Sleeve & Hanger Co., Cleveland, Ohio.

GAS BURNERS

Cleveland Gas Burner & Appliance Co., Detroit, Mich.

GASKETS, METALLIC.

Sarco Co., New York.

GAUGE BOARDS.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Co., Cleveland, Ohio.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Taylor Instrument Cos., Rochester, N. Y.
Webster & Co., Warren, Camden, N. J.

GAUGES.

Altitude.

Pierce, Butler & Pierce Corp., New York.

Draft.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

Hydraulic.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

Ounce Graduated.

Marsh & Co., Jas. P., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.

Pressure.

American Dist. Steam Co., North Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.
Bishop & Babcock Co., Cleveland, Ohio.

Vacuum.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Taylor Instrument Cos., Rochester, N. Y.
Webster & Co., Warren, Camden, N. J.

Vacuum (Compound).

Cashin Co., W. D., Boston, Mass.
Pierce, Butler & Pierce Corp., New York.

Water.

American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenburg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Bristol Co., Waterbury, Conn.
Jenkins Bros., New York.

GENERATOR COOLING SYSTEMS.

Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Mass.

GOVERNORS, (Pump).

Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Stickle Steam Specialties Co., Indianapolis, Ind.
Westinghouse Elec. &. Mfg. Co., East Pittsburgh, Pa.
Wright-Austin Co., Detroit, Mich.

GRATES

Dumping

Pyramid Iron Products Co., New York.

Rocking

Pyramid Iron Products Co., New York.

Shaking

Pyramid Iron Products Co., New York.

Shaking and Dumping

Pyramid Iron Products Co., New York.

Shaking, Circular

Pyramid Iron Products Co., New York.

Stationary

Pyramid Iron Products Co., New York.

HEATERS.

Domestic Water.

Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., No. Tonawanda, N. Y.
American Radiator Co., Chicago, Ill.
Bryant Heater & Mfg. Co., Cleveland, Ohio.
Dahlquist Mfg. Co., Boston, Mass.
Everhot Heater Co., Detroit, Mich.
Excelso Specialty Works, Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Pierce, Butler & Pierce Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., Erie, Pa.
Thermal Appliance Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

Feed Water, (Closed).

Alberger Heater Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Simmons Co., John, New York.
Sims Co., Erie, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Whitlock Coil Pipe Co., Hartford, Conn.

Feed Water, (Open).

Griscom-Russell Co., New York.
Sims Co., Erie, Pa.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.

Fuel-oil.

Alberger Heater Co., Buffalo, N. Y.
American Blower Co., Detroit, Mich.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Inc., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

Air, Fan System.

Aerofin Corporation, Newark, N. J.
American Blower Co., Detroit, Mich.
American Radiator Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

Portable Unit Air.

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Dwyer Equipment Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
Pecco Incorporated, St. Louis, Mo.
Skinner Bros. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Supreme Heater & Ventilating Corp., St. Louis, Mo.
L. J. Wing Mfg. Co., New York.
(See also Ventilators, Portable Unit.)

HEATING SYSTEMS.

"Gasteam".

James B. Clow & Sons, Chicago, Ill.

Vacuum.

Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.

Vapor.

American District Steam Co., No. Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gold Car Heating & Lighting Co., Brooklyn, N. Y.
Gorton & Lidgerwood Co., New York.
Grinnell Company, Providence, R. I.
Haines & Co., Wm. S., Philadelphia, Pa.
Ideal Heating Equip. Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mouat Vapor Heating Co., Cleveland, O.
H. W. Nelson Co., Moline, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane & Co., La Crosse, Wis.
Vapor Heating Co., York, Pa.
Webster & Co., Warren, Camden, N. J.

Water.

Grinnell Company, Providence, R. I.
Thrush & Co., H. A., Peru, Ind.

HUMIDIFIERS

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N. J.
Grinnell Company, Providence, R. I.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

HUMIDITY CONTROL.

American Blower Co., Detroit, Mich.
Atlas Valve Co., Newark, N. J.
Atmospheric Conditioning Corp., Phila, Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The Foxboro, Mass.
Grinnell Company, Providence, R. I.
Klipfel Mfg. Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

INCINERATORS

Home Incinerator Co., Milwaukee, Wis.

INSTRUMENTS

Electric Measuring.

Bristol Co., Waterbury, Conn.
Taylor Instrument Cos., Rochester, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburg, Pa.

Indicating and Recording.

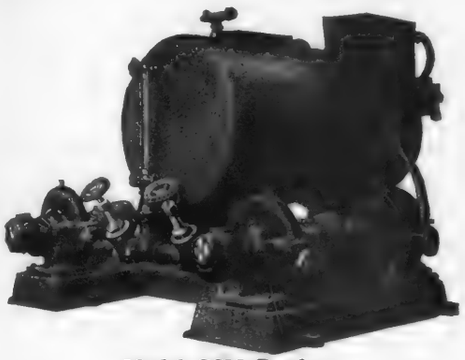
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Bailey Meter Co., Cleveland, O.
Foxboro Co., Inc., The Foxboro, Mass.
Hill, E. Vernon Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., New York.
Taylor Instrument Cos., Rochester, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburg, Pa.

INSULATING MATERIALS.

American District Steam Co., No. Tonawanda, N. Y.
Hornung, J. C., Chicago, Ill.
Johns-Manville, Inc., New York.
Ric-Wil Co., Cleveland, O.
Union Fibre Co., Winona, Minn.
Wyckoff & Sons, A., Elmira, N. Y.

MANOMETERS.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.



Model CSM Duplex

Reputable Engineers and Contractors use only Up-to-the-minute Equipment of Highest Efficiency

The Economy CSM Pumps and Receivers are designed for use in installations where the best mechanical equipment is required.

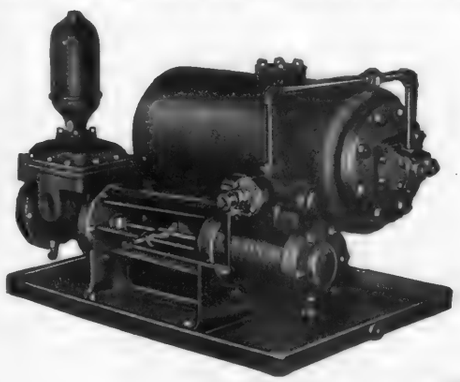
They are equipped with double suction horizontal split case bronze fitted pumps, cast iron or steel receivers with improved float switches and operating mechanisms, automatic starters with overload protection and 40 degree motors of standard makes. A full set of trimmings, together with the electrical connections from the motor to the automatic control are also included, making the unit complete, self-contained and ready to start.

Every pump is tested for the conditions under which it will operate.

Economy Pumping Machinery Company

71-122 N. CURTIS STREET, CHICAGO, ILL.

AMERICAN-MARSH CONDENSATION PUMPS



Steam and Motor Driven

The American-Marsh line of pumps for heating systems includes:

Boiler Feed Pumps

Vacuum Pumps, steam and motor driven

Hot Water Circulating Pumps

Sump or Bilge Pumps

Condensation Pumps, steam and motor driven, vertical and horizontal

Automatic Boiler Feed Pumps and Receivers

American-Marsh Pumps are the result of over 35 years experience in the building of high grade pumping machinery. There are over 165,000 in actual operation. Every pump is made with only the very best of material and workmanship and combine reliability with highest efficiency.

Ask for bulletins covering the types in which you are interested.

AMERICAN STEAM PUMP COMPANY, BATTLE CREEK, MICH.

ENGINEERS' SPECIFICATION INDEX (Continued)

MECHANICAL DRAFT APPARATUS.

American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park Mass.
L. J. Wing Co., New York.

METERS.

Condensation.

American Dist. Steam Co., No. Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.
Hornung, J. C., Chicago, Ill.

Feed Water.

Central Station Steam Co., Detroit, Mich.
Simmons Co., John, 11 Centre St., New York.

Feed Water (Wier Type).

Webster & Co., Warren, Camden, N. J.

Pitot Tube.

American Blower Co., Detroit, Mich.

Steam.

American District Steam Co., No. Tonawanda, N. Y.
Foxboro Co., Inc., The Foxboro, Mass.

MOTORS (Electric).

Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

OZONE APPARATUS.

Ozone Pure Airifier Co., Chicago, Ill.
United States Ozone Co., Scottdale, Pa.

PIPE.

Cast Iron.

Clow & Sons, Jas. B., Chicago, Ill.

Soil.

Simmons Co., John, 110 Centre St., New York.

Steel.

National Tube Co., Pittsburgh, Pa.
Simmons Co., John, 110 Centre St., New York.

Wrought Iron.

Simmons Co., John, 110 Centre St., New York.

Wood.

Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE BENDING.

Badger & Sons Co., E. B., Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Grinnell Company, Providence, R. I.
National Pipe Bending Co., New Haven, Conn.
Simmons Co., John, 110 Centre St., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING (Wood).

American District Steam Co., No. Tonawanda, N. Y.
Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE HANGERS.

Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Simmons Co., John, 110 Center St., New York.

PIPE, POWER.

Grinnell Company, Providence, R. I.
Simmons Co., John, 110 Centre St., New York.

PUMPS.

Centrifugal.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Taylor Machine Works, Battle Creek, Mich.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Weinman Pump Mfg. Co., Columbus, Ohio.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Yeomans Bros. Co., Chicago, Ill.
Young Pump Co., Michigan City, Ind.

Condensation.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Weinman Pump Mfg. Co., Columbus, Ohio.
Wright-Austin Co., Detroit, Mich.
Yeomans Bros. Co., Chicago, Ill.
Wright-Austin Co., Detroit, Mich.
Yeomans Bros. Co., Chicago, Ill.

Rotary.

Nash Engineering Co., So. Norwalk, Conn.

Steam.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Nash Engineering Co., So. Norwalk, Conn.

Turbine.

Nash Engineering Co., So. Norwalk, Conn.
Weinman Pump Mfg. Co., Columbus, Ohio.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Yeomans Bros., Chicago, Ill.

Vacuum.

American Steam Pump Co., Battle Creek, Mich.
Bishop & Babcock Co., Cleveland, Ohio.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Elliott Co., Jeannette, Pa.
McAlear Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Skidmore Corp., Chicago, Ill.
Trane Co., La Crosse, Wis.
Weinman Pump Mfg. Co., Columbus, Ohio.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Yeomans Bros., Chicago, Ill.
Young Pump Co., Michigan City, Ind.

RADIATOR BUSHINGS.

Metering.

Holley Engineering Co, Virginia, Minn.

RADIATOR COVERS.

Acme Radiator Shield Co., Cincinnati, Ohio.

RADIATOR HANGERS.

Farley Sleeve & Hanger Co., Cleveland, Ohio.
Gloeckle, Jr., A. F., Rochester, N. Y.
Grinnell Company, Providence, R. I.
Healy-Ruff Co., Minneapolis, Minn.
Pierce, Butler & Pierce Mfg. Co., New York.

RADIATORS.

"Gasteam."

James B. Clow & Sons, Chicago, Ill.

"Gaswater."

Clow & Sons, Jas. B., Chicago, Ill.

RADIATORS, STEAM AND WATER.

Aerofin Corp., Newark, N. J.
American Radiator Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Gurney Heater Mfg. Co., Boston, Mass.
Lyon Products Co., Chicago, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.
Richmond Radiator Co., New York.
Simmons Co., John, New York.

RECEIVERS.

Air.

American District Steam Co., No. Tonawanda, N. Y.
The Brownell Co., Dayton, Ohio.
Sterling Engineering Co., Milwaukee, Wis.

Condensation.

Chicago Pump Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Yeomans Bros., Chicago, Ill.

REGULATORS.

Boiler-Feed.

Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Stickle Steam Specialties Co., Indianapolis, Ind.
Thrush & Co., H. A., Peru, Ind.
Wright-Austin Co., Detroit, Mich.

Damper.

American Dist. Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
American Radiator Co., Chicago, Ill.
Bishop & Babcock Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Regulator Co., Chicago, Ill.
Nelson Co., H. W., Moline, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Simplex Heating Specialty Co., Inc., Lynchburgh, Va.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Thrush & Co., H. A., Peru, Ind.
Trane Co., La Crosse, Wis.
L. J. Wing Mfg. Co., New York.

Pressure.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Foxboro Co., Inc., The Foxboro, Mass.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
National Regulator Co., Chicago, Ill.
Stickle Steam Specialties Co., Indianapolis, Ind.
Taylor Instrument Cos., Rochester, N. Y.
Thrush & Co., H. A., Peru, Ind.

Temperature.

American Radiator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Co., Cleveland, Ohio.
Carrier Engineering Corporation, Newark, N. J.
Elliott Co., Jeannette, Pa.
Foxboro Co., Inc., The Foxboro, Mass.
Fulton Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.
Taylor Instrument Cos., Rochester, N. Y.

SEPARATORS.

Oil.

Elliott Co., Jeannette, Pa.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Stickle Steam Specialties Co., Indianapolis, Ind.
Wright-Austin Co., Detroit, Mich.

Steam.

American District Steam Co., No. Tonawanda, N. Y.
Bishop & Babcock Co., Cleveland, Ohio.
Elliott Co., Jeannette, Pa.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Sims Co., Erie, Pa.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

SPRAY COOLING SYSTEMS.

Atmospheric Conditioning Corp., Phila., Pa.
Bayley Mfg. Co., Milwaukee, Wis.
Massachusetts Blower Co., Watertown, Mass.

SPRINKLER HEADS

C. S. B. Sprinkler Co., Boston, Mass.

STRAINERS.

Oil.

Elliott Co., Jeannette, Pa.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.

Steam.

American Dist. Steam Co., No. Tonawanda, N. Y.
Dunham Co., C. A., Chicago, Ill.
Eliott Co., Jeannette, Pa.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mason Regular Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., New York.
Sterling Engineering Co, Milwaukee, Wis.
Wright-Austin Co., Detroit, Mich.

Water.

American Dist. Steam Co., No. Tonawanda, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Sarco Co., New York.

THERMOMETERS.

(Recording and Indicating).

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The Foxboro, Mass.
Moto Meter Company, Inc., Long Island City, N. Y.
Sarco Co., New York.
Taylor Instrument Cos., Rochester, N. Y.

Water.

Marsh & Co., Jas. P., Chicago, Ill.
Pierce, Butler & Pierce Corp., New York.

THERMOSTATS.

American Radiator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Co., Cleveland, Ohio.
Fulton Co., Knoxville, Tenn.
Johnson Service Co., Milwaukee, Wis.
Klipfel Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.
Thrush & Co., H. A., Peru, Ind.

TRAPS.

Radiator.

Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, Ohio.
Cashin Co., W. D. Boston, Mass.
Dole Valve Co., Chicago, Ill.
Dunham, C. A., Co., Chicago, Ill.
Hoffman Specialty Co., New York.
Ideal Heating Equipment Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Johns-Manville, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mouat Vapor Heating Co., Cleveland, O.
H. W. Nelson Co., Moline, Ill.
O-E Specialty Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

"CHICAGO" PUMPS

Give You

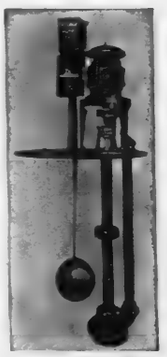
HIGH QUALITY at a REASONABLE COST

"SURE RETURN" CONDENSATION PUMP
Ask for Bulletin 47.

The best workmanship and finest materials obtainable are used in building "Sure Return" Condensation and "L-1" Bilge Pumps — yet we are able to sell them at very low prices.

Hundreds of each size are put through our modern shop at one time—but each unit gets individual care and inspection. Thus you are assured of a reasonably-priced, proper working outfit.

Try a "Chicago" pump on your next hard job. You will like the result.

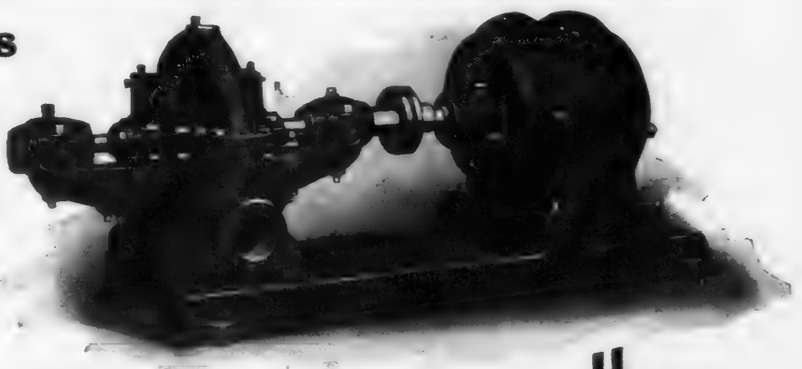


"L-1" BILGE PUMP
Ask for Bulletin 48

CHICAGO PUMP CO.

2332 Wolfram Street Chicago, Ill.

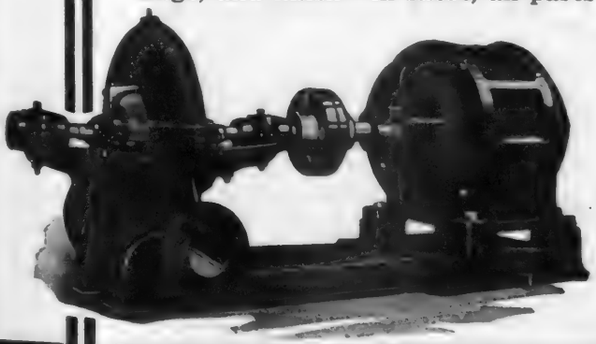
"Buffalo" Class "S" Pumps are favored— Because—



No other pump is so extensively used by air washer manufacturers, and no other so commonly specified on heating jobs.

This popularity is due to their efficient design, which enables them to "stay on the job"; and an additional advantage of a low price—which is, of course, the result of quantity production.

Horizontally divided casing, double suction hydraulically balanced impeller, brass clearance rings, large, properly lubricated bearings, stuffing boxes large enough to hold plenty of packing, water seals, sub-base, coupling, fittings, and finish—in short, all parts of Class "S" Pumps—are of such design and finish as to insure the best results possible.



And the price is low.

Send for Bulletin 55-36 for the whole story.

Buffalo Steam Pump Co.

480 BROADWAY BUFFALO, N. Y.

ENGINEERS' SPECIFICATION INDEX (Continued)

Return.
American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago Ill.
Johns-Manville, Inc., New York.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mouat Vapor Heating Co., Cleveland, O.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Simplex Heating Specialty Co., Inc., Lynchburgh, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

Steam.
American Blower Co., Detroit, Mich.
American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Elliott Co., Jeannette, Pa.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johns-Manville, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Sarco Co., New York.
Simmons Co., John, New York.
Stickle Steam Specialties Co., Indianapolis, Ind.
Trane Co., La Crosse, Wis.
Wright-Austin Co., Detroit, Mich.

Vacuum.
American Blower Co., Detroit, Mich.
Bishop & Babcock Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

TURBINES (Steam).
Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co. East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.

TURBO-BLOWERS.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

UNDERGROUND PIPE CONDUITS.
American District Steam Co., No. Tonawanda, N. Y.
Hornung, P. C., Chicago, Ill.
Johns-Manville, Inc., New York.
Ric-Wil Co., Cleveland, O.
Wyckoff & Son, A., Elmira, N. Y.

VACUUM CLEANING APPARATUS.
American Radiator Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

VACUUM PRODUCERS.
A. & P. Regulator Co., Park Ridge, Ill.

VALVES.

Air (Automatic).
American Radiator Co., Chicago, Ill.
Commonwealth Brass Corporation, Detroit, Mich.
Dole Valve Co., Chicago, Ill.
Fulton Co., Knoxville, Tenn.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Klipfel Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Pierce, Butler & Pierce Corp., New York.
Russell & Co., W. A., New York.
Simmons Co., John, New York.

Air Relief.
American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Fulton Co., Knoxville, Tenn.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Russell & Co., W. A., New York.
Sterling Engineering Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.

Back Pressure.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Simmons Co., John, New York.
Stickle Steam Specialties Co., Indianapolis, Ind.

Balanced.
American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Stickle Steam Specialties Co., Indianapolis, Ind.

Blow-off.
Elliott Co., Jeannette, Pa.
Jenkins Bros., New York.
The Wm. Powell Co., Cincinnati, O.
Simmons Co., John, New York.

Check.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Simmons Co., John, New York.

Float.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Grinnell Company, Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller Co., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Stickle Steam Specialties Co., Indianapolis, Ind.

Gate.
American District Steam Co., No. Tonawanda, N. Y.
Dole Valve Co., Chicago, Ill.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Erie, Pa.
Powell Co., Wm., Cincinnati, O.
Simmons Co., John, New York.

Globe, Angle and Cross.
Commonwealth Brass Corp., Detroit, Mich.
Dole Valve Co., Chicago, Ill.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Erie, Pa.
Pierce, Butler & Pierce Corp., New York.
Powell Co., Wm., Cincinnati, O.
Simmons Co., John, New York.

Hydraulic-Operating.
Atlas Valve Co., Newark, N. J.
Klippel Mfg. Co., Chicago, Ill.

Non-Return.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, O.
Simmons Co., John, New York.

Radiator.
American Radiator Co., Chicago, Ill.
American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, Ohio.
Commonwealth Brass Corporation, Detroit, Mich.
Dole Valve Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Fulton Co., Knoxville, Tenn.
Gold Car Heating & Lighting Co., Brooklyn, N. Y.
Gorton & Lidgerwood Co., New York.
Ideal Heating Equip. Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
Powell Co., Wm., Cincinnati, O.
Russell & Co., W. A., New York.
Trane Co., La Crosse, Wis.
Simmons Co., John, New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.

Reducing.
American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.

Regulating.
American District Steam Co., No. Tonawanda, N. Y.
Fulton Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Klipfel Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, O.

Relief (Water).
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, Ohio.

Safety.
American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Jenkins Bros., New York.
Powell Co., Wm., Cincinnati, O.

Stop and Check.
(See Valves, Non Return).

VENTILATING HEATERS

Portable Unit.
American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, Ohio.
H. W. Nelson Co., Moline, Ill.
Nesbitt, John J., Inc., Atlantic City, N. J.
Peerless Unit Ventilating Co., New York.
Stickle Steam Specialties Co., Indianapolis, Ind.
Sturtevant Co., B. F., Hyde Park, Mass.
(See also Heaters, Portable Unit Air).

VENTILATING SYSTEMS
American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila, Pa.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
H. W. Nelson Co., Moline, Ill.
Nesbitt, John J., Inc., Atlantic City, N. J.
New York Blower Co., Chicago, Ill.
Peerless Unit Ventilating Co., New York.
Skinner Bros. Mfg. Co., St. Louis Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg Co., New York.

VENTILATORS.
Allen Air-Turbine Ventilator Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

Mushroom.
Knowles Mushroom Ventilator Co., New York.
Lyon Products Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

WEATHER STRIPS.

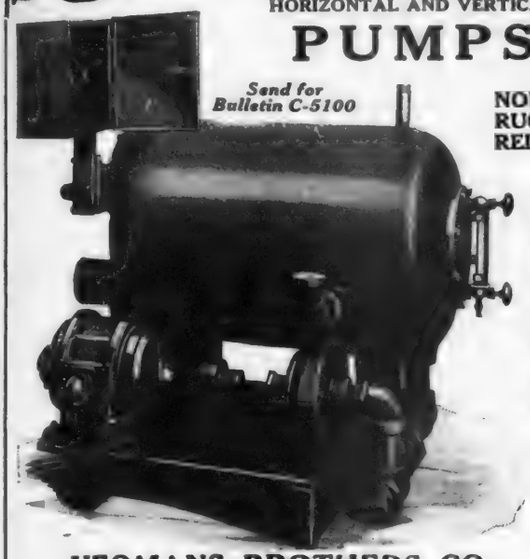
Metal.
Athey Company, Chicago, Ill.
Chamberlin Metal Weather Strip Co., Detroit, Mich.
Higgin Manufacturing Co., Newport, Ky.
Monarch Metal Products Co., St. Louis, Mo.

WELDING MATERIALS.
Linde Air Products Co., New York.
Oxweld Acetylene Co., Long Island City, N. Y.
Prest-O-Lite Co., Inc., New York.

STEAM TRAPS
AIR TRAPS
STEAM SEPARATORS
EXHAUST HEADS
OIL SEPARATORS
BOILER ALARM WATER COLUMNS
STRAINERS
WRIGHT
AUSTIN
WRIGHT-AUSTIN CO.
DETROIT, MICHIGAN

YEOMANS

AUTOMATIC ELECTRIC
CONDENSATION
HORIZONTAL AND VERTICAL
PUMPS



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RELIABLE

For Gravity Return Heating System

Cast Iron Receiver

Continuous Base

Built to meet all pressure and capacity requirements.

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GUIDED
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Excels in

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Over 60% of sales—Repeat Orders
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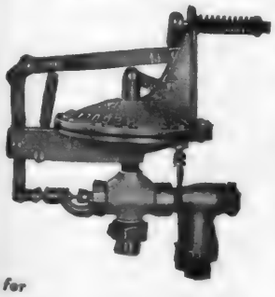
ROSS HEATER & MFG. CO., INC., BUFFALO, N. Y.
New York, Chicago, Philadelphia, Boston, Cleveland, St. Louis, Detroit, Pittsburgh, Baltimore, San Francisco, Seattle, Denver, Salt Lake City, Omaha, Montreal, Toronto.

A REMEDY FOR BALKY SYSTEMS



THE A & P AUTOMATIC HYDRAULIC VACUUM PRODUCER MAINTAINS CONSTANT VACUUM IN STEAM HEATING SYSTEMS

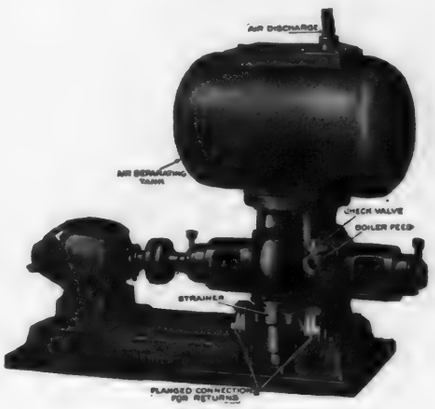
No tampering with air valves, foul air eliminated. No water hammering. Efficiency proved, merits investigation.

for
Churches, Schools, Residences, Theatres, Industrial Bldgs.

Ask for prices and Bulletin No. 1

A & P REGULATOR CO., Park Ridge, Ill.

SKIDMORE HYDRO TURBINE VACUUM AND BOILER FEED PUMP



SET THEM AS THEY COME CONNECT RETURNS, WIRE MOTOR AND RUN

Operates on a different principle.

Simple, Efficient and Sure.

Manufactured of highest grade material along lines of best engineering practice.

All parts are accurately machined.

The base, casing, bearing brackets and tank are fine-grained cast iron.

The shaft is Tobin Bronze carried on heavy ball bearings.

The air rotor and centrifugal pump are bronze castings.

The Skidmore occupies half the floor space required for other makes of pumps.

A self-contained unit requiring no piping

Engineers requiring the best and wanting a pump, the high efficiency of which remains constant, should specify the Skidmore.

Bulletin No. 2 will be sent on request.

Built in five sizes for 10 and 20 lbs. pressure to handle 8000, 16000, 26000, 40000, and 65000 sq. ft. of radiation, for continuous service or with automatic control.

SKIDMORE CORPORATION
General Offices and Factory
1535 Dayton St. CHICAGO, U. S. A.

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Save Coal—Prevent Condensation

Insulate All Roofs

To the left: Boulevard Presbyterian Church, Cleveland, Ohio, **insulated** with **FIBROFELT.**
Architect: W. H. Nickles, Cleveland, Ohio.
Contractor: Phillip Kitzer, Cleveland, Ohio.

ALWAYS USE INTERNAL CONDUCTIVITIES, not air to air conductivities when figuring proper thickness for roof insulation. ASK US WHY?

Union Fibre Co., Inc.

Engineers and Manufacturers

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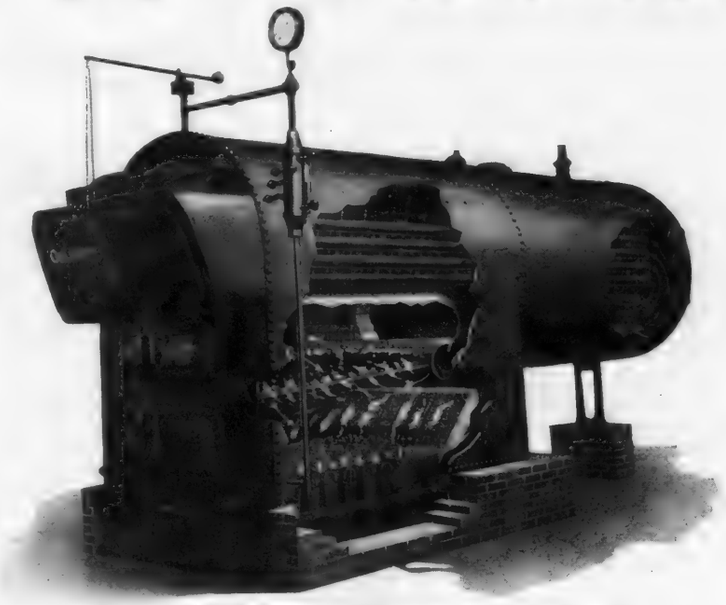
OIL CITY BOILERS

The widespread preference for Oil City Boilers by the educational institutions of the country is evidence of confidence in Oil City service.

"Safety first" then efficiency and maintenance does seem to mean "Oil City."

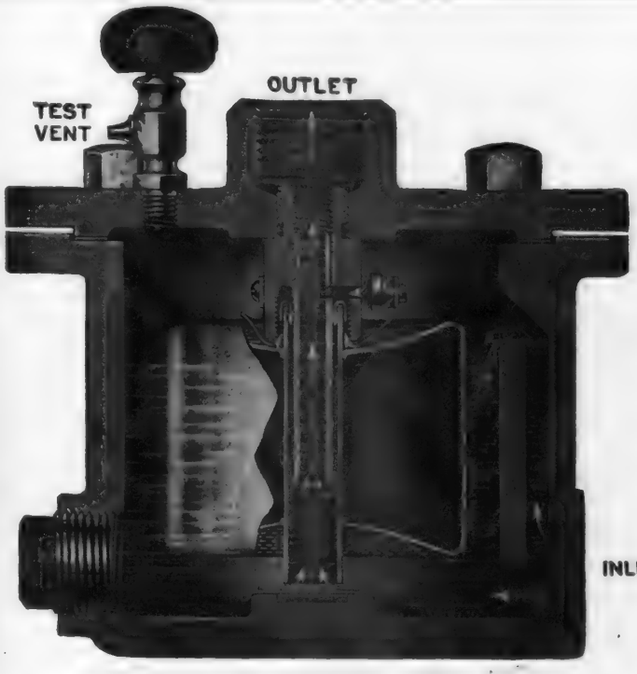
Catalog H-9 will be sent upon request.



Built of Steel, in Accordance with the A. S. M. E. Code

OIL CITY BOILER WORKS, OIL CITY, PA.

NEW YORK CHICAGO PITTSBURGH ATLANTA PHILADELPHIA LOS ANGELES



MARSH

DUPLEX WATER SEAL LOW PRESSURE

BLAST TRAP

for direct or indirect coils or any location where large quantities of water are to be discharged

Operates automatically either with or without mechanical suction on return line.

No complicated parts to stick or get out of order.

No small openings to clog up with sediment or scale.

Free passage of water—rapid and steady vent of air and passes no steam.

Combined action of flotation for water and all metal thermostatic vent for air together with relief of air through water seal makes the ideal trap for heavy service.

Adjusted and tested at factory and shipped ready for installation, to work automatically from below atmosphere on up to 25 pounds steam pressure.

We Invite Correspondence

JAS. P. MARSH & CO., 118-124 South Clinton Street, Chicago

FOUNDED 1865

Manufacturers of Radiator Traps and Specialties—Automatic Air Valves and Vents Indicating and Recording Gauges

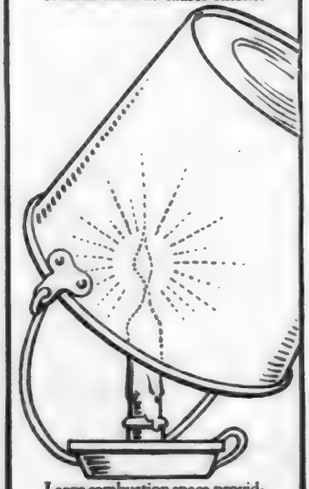
Agents for Great Britain and Ireland: Chatterton & Co., 30 Fetter Lane, E. C. 4, London
Agents for Dominion of Canada: Taylor-Forbes Co., Ltd., Guelph, Ontario

Experiment with ordinary lighted candle showing the importance of combustion space in a heating boiler.

A thimble placed over wick extinguishes flame immediately.

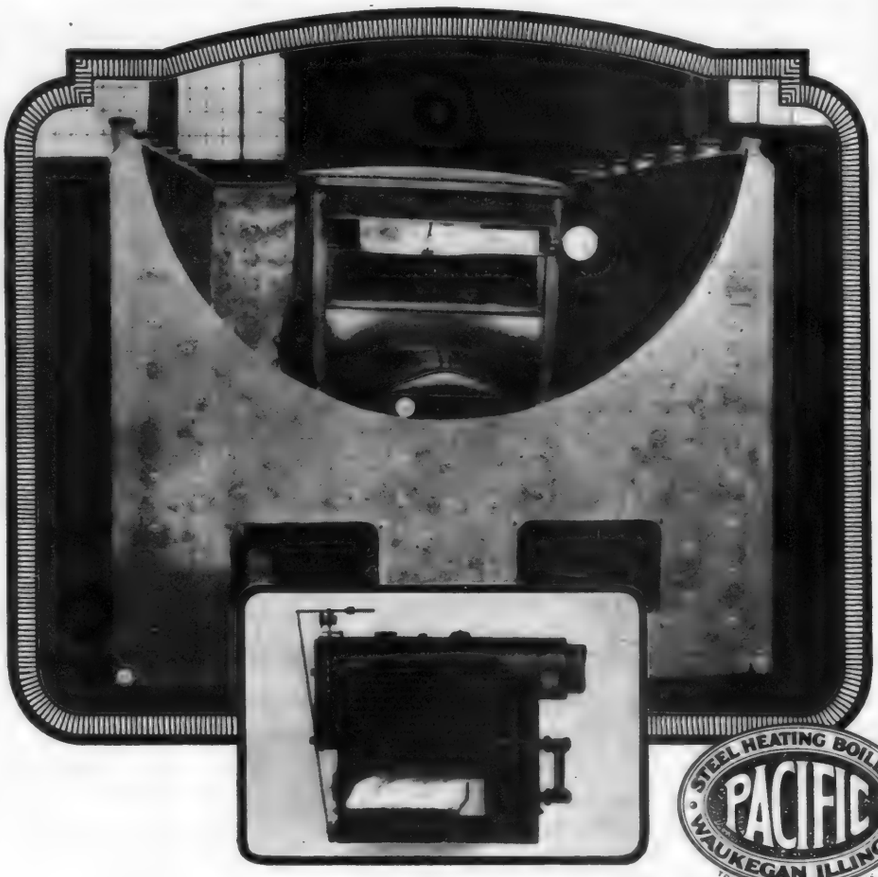
Small glass placed over flame causes it to die down. Minimum amount of heat given off

Large water glass permits freer combustion but causes smoke.



Large combustion space provided by placing pail over flame. Permits maximum combustion. Candle burns brightly, generating heat without smoke.

GREATER Combustion Space



Greater combustion space is one of the factors responsible for the remarkable efficiency of Pacific boilers.

Observe the illustrations at the left. They explain why maximum combustion space is so vital to satisfactory boiler performance.

The large illustration (showing Ford car standing in fire box of a Pacific Boiler) gives some idea of the tremendous combustion space as compared with the complete boiler. The result is maximum heat generated from fuel consumed—real heating economy.

The firebox in all Pacific Boilers extends full length of boiler, affording the greatest possible combustion space and direct heating surface.

This is only one of many Pacific features. Let us send you complete information.

GENERAL BOILERS COMPANY, Waukegan, Illinois
SALES OFFICES IN ALL PRINCIPAL CITIES

PACIFIC
STEEL HEATING BOILERS

Why are KEWANEE FIREBOX BOILERS selected for heating finer buildings?

First

BECAUSE they can be depended upon to give ample heat with low fuel cost and upkeep

And

their service is backed by a responsible concern.

UNION DAVENPORT TRUST & SAVINGS BANK, Davenport, Iowa
Hoggson Bros., New York, *Architects, Builders.* Temple & Burrows, Davenport, *Associate Architects*
Two No. 320 Kewanee Smokeless Boilers installed by Van Denberg Supply Company, Rockford, Ill.

KEWANEE BOILER COMPANY

KEWANEE, ILLINOIS

BRANCHES

Atlanta	Chicago	Denver	Indianapolis	Minneapolis	Salt Lake City
Birmingham	Cincinnati	Des Moines	Kansas City	New York City	San Antonio
Boston	Cleveland	Detroit	Los Angeles	Philadelphia	San Francisco
Charlotte, N. C.	Columbus	El Paso	Memphis	Pittsburgh	Seattle
Chattanooga	Dallas	Grand Rapids	Milwaukee	St Louis	Spokane
					Toledo

Dominion Kewanee Boiler Company, Ltd., Toronto, Ont

No. 6—23 W
Water Boiler

Gurney New 400 Series Boilers

Another distinctive series of the Gurney Line of Boilers is the "New 400 Series" of steam and water boilers.

This series has been improved steadily and now represents all that could be desired of a modern boiler designed especially for heating residences and buildings of moderate size. Refinement, durability, simplicity, ease of operation and economy in fuel consumption have been brought to highest perfection. The purchaser is assured best heating efficiency with minimum amount of fuel and care.

Some leading features are: Highly efficient triangular grates, positive and rapid circulation of water in close contact with fire and heated gases at every available point; large and roomy ash pit and base; improved taper push nipple connections, and accessibility of all fire and flue surfaces for cleaning.

Send for Catalog

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The **Universal**

is the only double-grate down-draft boiler on the market that will operate satisfactorily on the same size stack as an up-draft boiler of similar capacity.

Ask Us Why?

MOSE, WHAT ARE YOU CUTTING THAT SHOVEL OFF FOR?
WHY DE BOSS SAY TO USE ONLY TEN SHOVELS FULL AND DIS UNIVERSAL BOILER" MAKES TOO MUCH HEAT DAT WAY
COAL
UNIVERSAL SMOKELESS BOILER COMPANY
RAVENNA OHIO
FACTORY—MAIN OFFICE

The 100% Water Tube Construction Saves Coal

Universal Smokeless Boilers Comply with the Law

Guaranteed to pass the smoke ordinance of all cities using bituminous high volatile coal
Expert or skilled firemen not necessary

UNIVERSAL SMOKELESS BOILER CO.

Factory and Main Office: RAVENNA, OHIO

Sectional Gas and Oil Boilers

Commonwealth Hotel, Chicago. JOHN NYDEN, Architect. Heated with Pacific Boilers equipped with WOLFF DRAFT CONDITIONERS.

5259 Chicago Buildings
Save Fuel with
WOLFF DRAFT CONDITIONERS

If you could see the thousands of fine buildings where WOLFF DRAFT CONDITIONERS are installed—if you could talk to the owners who pay the coal bills and to the men who fire the boilers—you would realize that they have *made good plus.*

Many building owners have installed them in every building they own, because they have learned that Wolff Draft Conditioners **save fuel, and heat a building better, with less attention.**

Careful records of fuel savings made with Wolff Draft Conditioners prove that they **very quickly pay back what it costs to install them.** And while they are saving fuel they help to keep tenants satisfied by providing a steady flow of heat.

Write us for full particulars.
Every heating contractor can make money installing them.

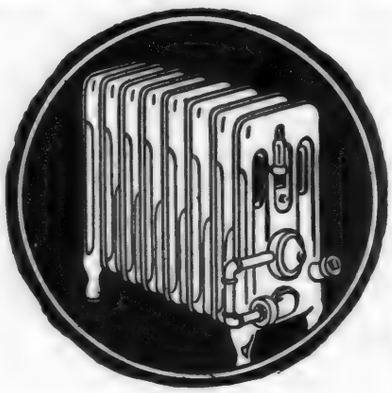
SALES REPRESENTATIVES CALLING ON ARCHITECTS, OWNERS and CONTRACTORS

We want a good representative in every city, not now covered, to sell Wolff Draft Conditioners to Architects, Heating Contractors and Owners. Write for our Agency Plan.

Wolff Coal Saver Co.

1336 West Congress St. **Chicago**

As easy to install as a gas range



Designed for the complete heating of old or new buildings—offices, stores, factories, schools, public buildings, residences, and apartments

EACH RADIATOR AN INDEPENDENT STEAM HEATING PLANT

Clow Gasteam Radiators are as easy to install and operate as a gas range. They give you steam heat when and where you want it. All you have to do is to turn a valve, and light as many or as few as you need.

Automatically Regulated

Clow Gasteam Radiators are automatically regulated to maintain an unvarying steam pressure regardless of outside temperatures.

They look like any other radiators, except possibly that they are more attractive in design. They are carefully built, carefully tested. They have twenty years' use back of them, and over forty years' of Clow experience and reputation.

Thousands of Users

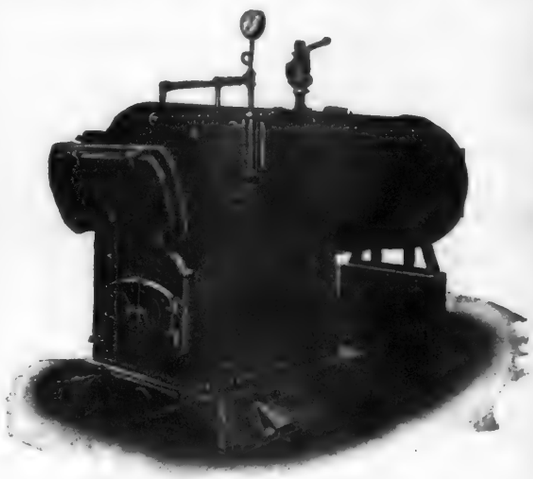
Thousands of satisfied users everywhere. We can furnish you with a list covering this vicinity.

For additional information about this modern, clean, convenient and healthful method of heating, write or call us to-day.

JAMES B. CLOW & SONS
534-546 So. Franklin St.,
CHICAGO

CLOW "GASTEAM" HEATING SYSTEMS

AMES
Firebox Heating Boilers



Ames Firebox Heating Boiler with Plain Furnace

Built with Plain and Downdraft Furnaces. Incorporating the Latest and Most Advanced Ideas in Boiler Design and Construction.

We also build a complete line of Horizontal Tubular, Upright and Empire Boilers for Heating and Power Requirements.

Bulletins with complete details mailed on request.

Empire Return Tubular Portable Boiler

AMES IRON WORKS
DIVISION OF
Pierce, Butler & Pierce Mfg. Corp.

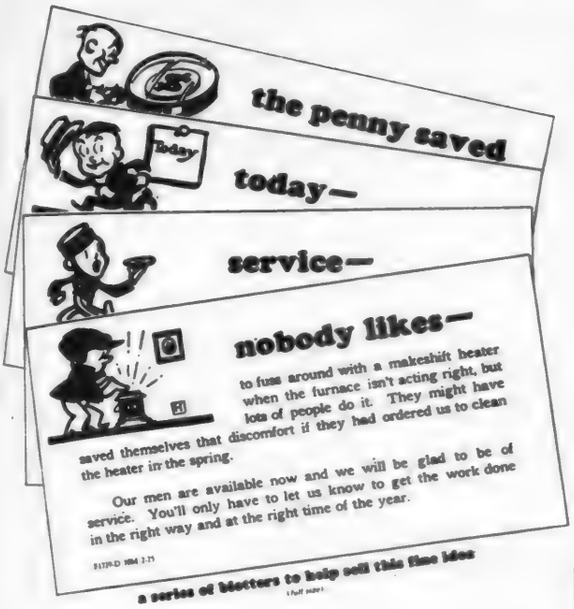
Main Office & Works
Oswego, N. Y.

General Sales Office
41 E. 42nd St., New York City

what next?

spring cleaning, of course—

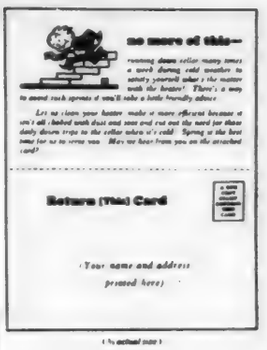
more business and profit for you!

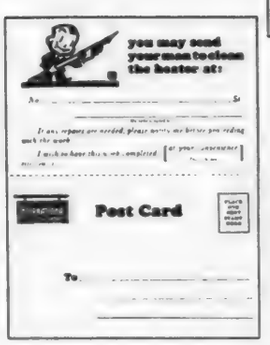

the penny saved
today—
service—
nobody likes—
to fuss around with a makeshift heater when the furnace isn't acting right, but lots of people do it. They might have saved themselves that discomfort if they had ordered us to clean the heater in the spring.
Our men are available now and we will be glad to be of service. You'll only have to let us know to get the work done in the right way and at the right time of the year.

a series of blotters to help sell this fine idea

six missionaries to work for you:

spring cleaning card
series of four blotters
coal booklet





a new spring cleaning card designed to create more customers

A booklet that builds good will and future trade for you.

The most complete booklet published on care and operation of heaters.

our customers like the plan:

"Can you also supply us with the postals sent out each year for the repairs and cleaning of furnaces? We have used these for the past two years and have had fine results. We would like to have a sample of this year's card before ordering."—Lewis & Dunkel, Gloversville, N. Y.

"These booklets sure were the thing I was looking for, as they are written so that almost anybody can understand them, and my customers certainly appreciate them."—H. M. Maginot Sales Co., Hammond, Ind.

"We were very much pleased with the cards reminding people to have their heaters looked after. Of the 150 cards sent out we received nearly 50 replies. Pretty good results."—E. E. Guion & Son, Mt. Vernon, N. Y.

Put these missionaries to work — Clip the coupon

International Heater Company
Utica, N. Y.

Enclosed find $ ..... for which please send:

..... Spring Cleaning Cards
..... Booklets with International imprint
..... Booklets with our own imprint
..... Blotters

Name .....

Address .....

how you get these business builders:

For the past several years we have furnished to the trade, cards for the solicition of repair, replacement and cleaning work.

These cards have proved very effective in bringing in business during the Spring and Summer months and have helped to put the balance on the right side of the ledger.

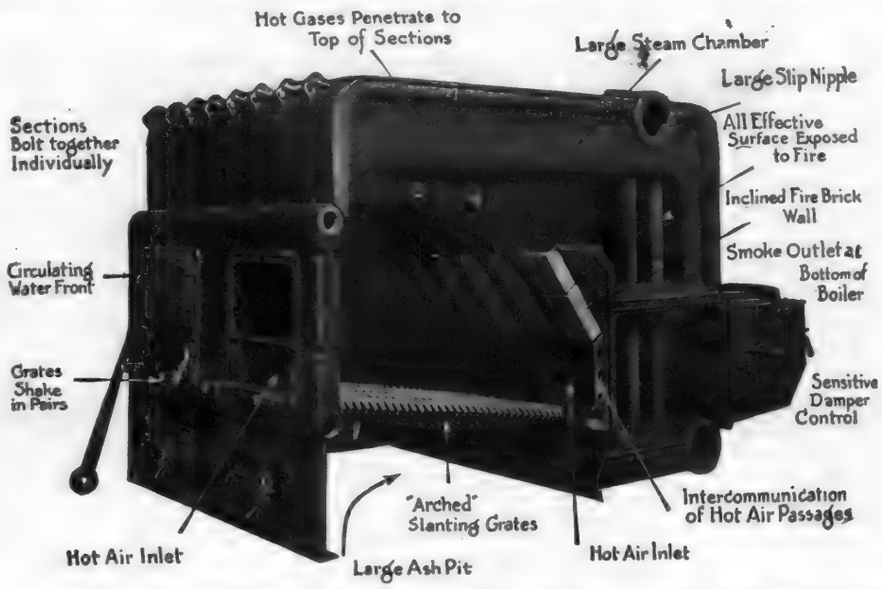
We purchase these cards in quantities and gladly supply them to the trade at cost.

It will be worth the slight cost of the booklet, to give each of your customers a copy of "How to Operate Your Heating Plant with Less Coal." It is the most complete and instructive booklet on proper care and operation that has ever been published. Order enough for your needs.

Cards and Booklets will be furnished at the following prices

100 Cards without your imprint	$ 1.00
200 Cards imprinted with your name and address	1.75
500 Cards imprinted with your name and address	3.75
1000 Cards imprinted with your name and address	6.00
(Imprinted orders not accepted for less than 300 cards)	
100 Booklets with International imprint on back cover	7.50
100 Booklets with your imprint on back cover	10.00
100 Blotters, 25 each design	35c

International Heater Company
Utica, N. Y.


Hot Gases Penetrate to Top of Sections
Large Steam Chamber
Large Slip Nipple
All Effective Surface Exposed to Fire
Inclined Fire Brick Wall
Smoke Outlet at Bottom of Boiler
Sensitive Damper Control
Intercommunication of Hot Air Passages
Hot Air Inlet
"Arched" Slanting Grates
Large Ash Pit
Hot Air Inlet
Sections Bolt together Individually
Circulating Water Front
Grates Shake in Pairs

Ask Us How To Save The Annoyance And Cost Of a Pit

Niagara boilers have a remarkably low water line, which makes them well suited for use in low-ceilinged basements. Large mains are not needed.

Be independent of fuel costs — the Niagara will handle soft or medium, as well as hard coal. Equally efficient with fuel oil burners.

Let us tell you about these boilers so that you can make more money selling them. Ask for Catalog No. 23, describing our sectional and round boilers (and Niagara Radiators) with full dimensions and much useful data.

NIAGARA RADIATOR & BOILER COMPANY

General Office and Factory—North Tonawanda, N. Y. Branch Office and Factory—Chicago, Ill.

NIAGARA LOW WATER LINE SMOKELESS BOILERS

IRON BODY GATE VALVES

SCREWED, FLANGED AND HUB END STYLES

NON-RISING STEM AND O. S. and Y. PATTERNS

ALSO MANUFACTURERS OF

Cast and Malleable Iron Fittings

Illinois Malleable Iron Company

1801 Diversey Parkway Chicago, Ill.

"Can IDEAL Boilers *burn oil?*"

"What special equipment does the Company furnish for oil burning?"

"What is the performance of IDEAL Boilers, oil-fired?"

"Can IDEAL Type A and the larger water tube IDEAL Boilers be used effectively with oil for fuel?"

SO MANY INQUIRIES have come to us concerning this increasingly important question that we have prepared in book form a practical and thorough analysis of the entire subject of oil burning as applied to IDEAL Boilers.

It tells the story completely. We will gladly mail a copy without cost or obligation on request to the address below. The coupon is for your convenience. Just fill it in and mail it today.

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SALES OFFICES IN ALL PRINCIPAL CITIES

IDEAL BOILERS AND AMERICAN RADIATORS FOR EVERY HEATING NEED

AMERICAN RADIATOR COMPANY
Dept. T115, 1807 Elmwood Avenue
Buffalo, New York

Without obligation, send me your new book, "IDEAL Boilers for Oil Burning."

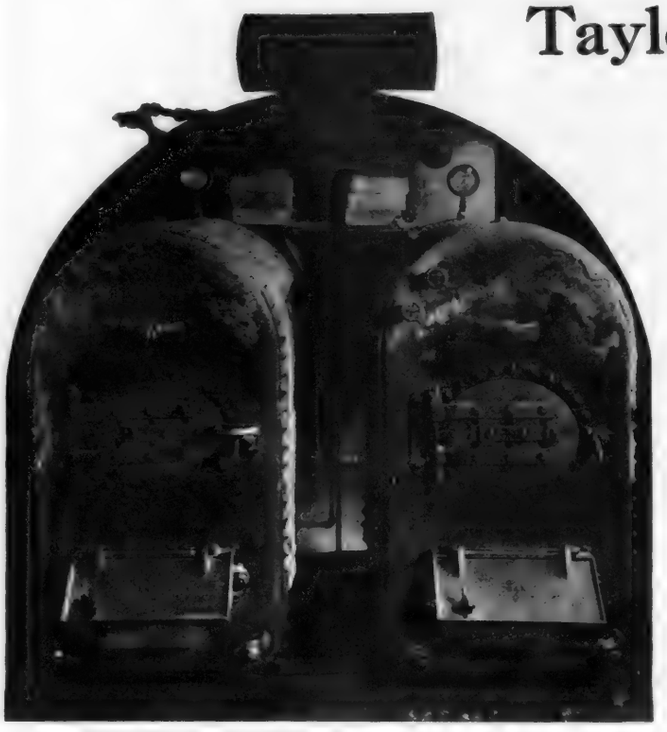
Name.....

Address.....

Town, State.....

Perfection *and* Protection

Taylor Boiler Feed Trap



A thorough study of boiler feed requirements and their actual application for a number of years enables us to offer a boiler feed trap that works with perfection and eliminates all boiler feed troubles.

A reliable service such as we guarantee protects your boilers against cracked sections, burnouts, etc., by maintaining the proper water line.

The trap shown here has been in service continuously over seven years—without repairs. This is typical of all Taylor installations.

Let us send details in full.

TAYLOR MACHINE WORKS

85 S. Monroe St., Battle Creek, Mich., U. S. A.

No Waiting for Hot Water

with Dalquist Aquatherm Copper Range Boiler

INSTEAD of having to wait for a whole tank of water to become heated, you may have instant hot water at a minimum cost by installing a **Dahlquist Aquatherm Copper Range Boiler.**

It is connected the same as an ordinary range boiler and can be furnished in any size desired.

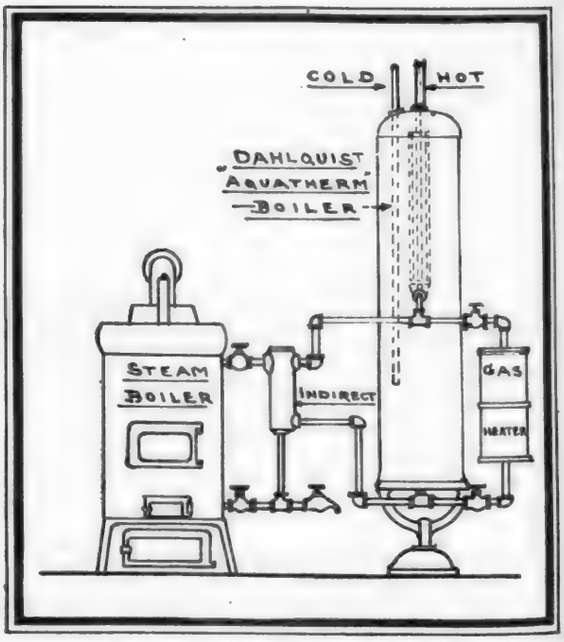
The **Dahlquist Aquatherm** can be furnished separately in proper size for any range boiler now installed.

When hot water is not drawn, the **Aquatherm** stores it in the range boiler. The action of the **Aquatherm** is entirely automatic.

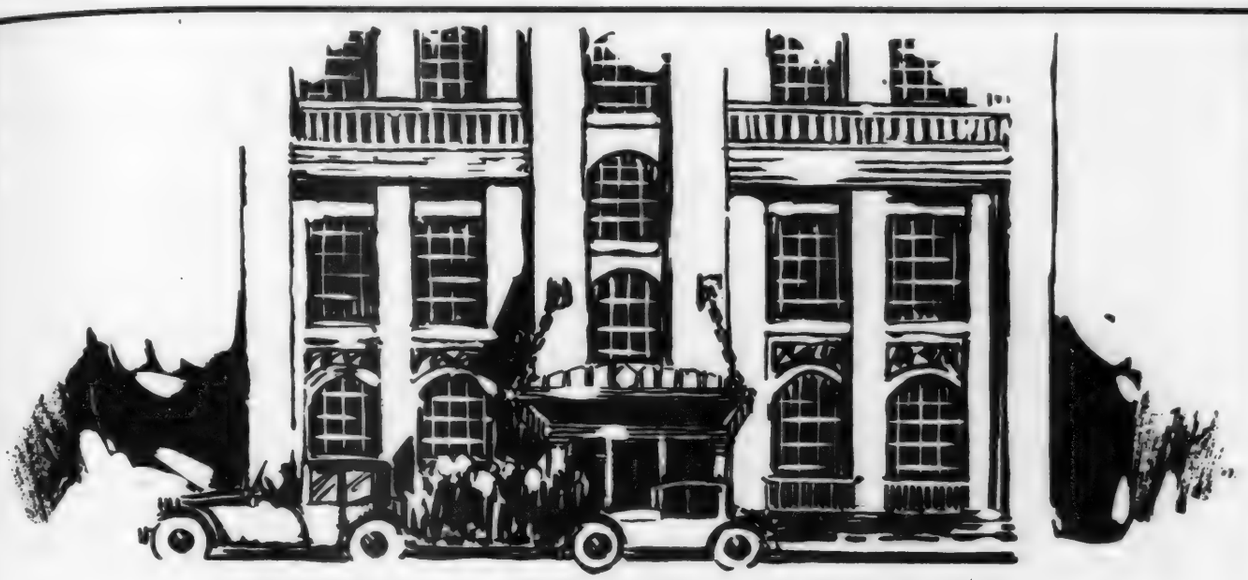
Let us send full details.

DAHLQUIST MFG. CO.

40 W. 3rd St. BOSTON, MASS.



Dahlquist Aquatherm Copper Range Boiler installed in cellar in connection with gas tank water heater and indirect water heater in cellar.

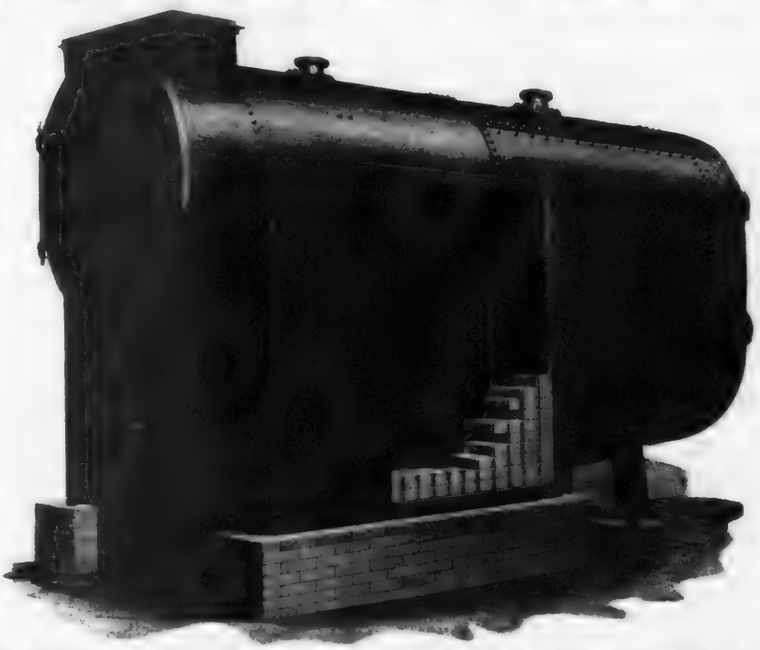


TITUSVILLE Perfection Boilers with their high brick lined firebox, steel casing and large effective heating surface, assure complete combustion of all fuels—solid liquid or gaseous—and lower fuel bills.

Built for power or steam heating, pressures 15 lbs. to 150 lbs. Can be readily adapted for oil burning.

Catalog No. 85-A of Titusville Boilers should be in the file of all architects and engineers.

TITUSVILLE
PERFECTION BOILERS



THE TITUSVILLE IRON WORKS COMPANY

TITUSVILLE, PENNA.

New York
152 West 42nd Street

Detroit, Mich.
833 Washington Blvd. Bldg.

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HOT WATER
BY
WHITLOCK
In All of These Hotels

SHERMAN HOTEL	ABERDEEN, S. D.
BATTERY PARK HOTEL	ASHEVILLE, N. C.
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KENILWORTH INN	ASHEVILLE, N. C.
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HOTEL DENNIS	ATLANTIC CITY, N. J.
HADDON HALL	ATLANTIC CITY, N. J.
RITZ CARLTON HOTEL	ATLANTIC CITY, N. J.
RUDOLPH HOTEL	ATLANTIC CITY, N. J.
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BELMONT HOTEL	CHICAGO, ILL.
CHURCHILL HOTEL	CHICAGO, ILL.
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SIGNAL MOUNTAIN INN	CHATTANOOGA, TENN.
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HOTEL BOND	HARTFORD, CONN.
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BENJAMIN FRANKLIN HOTEL	PHILADELPHIA, PA.
HOTEL PENNSYLVANIA	PHILADELPHIA, PA.
SYLVANIA HOTEL	PHILADELPHIA, PA.
WINDSOR HOTEL	PHILADELPHIA, PA.
POWERS HOTEL	ROCHESTER, N. Y.
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WISCONSIN HOTEL	SALISBURY, MD.
NICKEL RANGE HOTEL	SUDBURY, ONT.
WARREN HOTEL	WARRENTON, N. C.
NEW WILLARD HOTEL	WASHINGTON, D. C.

and many more. Consult Whitlock Engineers about your Hotel hot water problems.

THE WHITLOCK COIL PIPE CO.
40 South Street, Hartford, Conn.

New York Chicago Boston Buffalo Philadelphia
Baltimore San Francisco

WHITLOCK
HEAT TRANSFER
PRODUCTS

GORTON VALVES
In Use in

THE MATSON BUILDING
San Francisco, Calif.

BLISS & FAVILLE, Architects — THOMAS NORRIN, Engineer

QUALITY

Determined the use of 484 **GORTON QUARTER TURN PACKING LOCK RADIATOR VALVES** in the above building and in the following buildings:

New Pacific Tel. & Tel. Bldg., San Francisco, Cal.—900 Valves

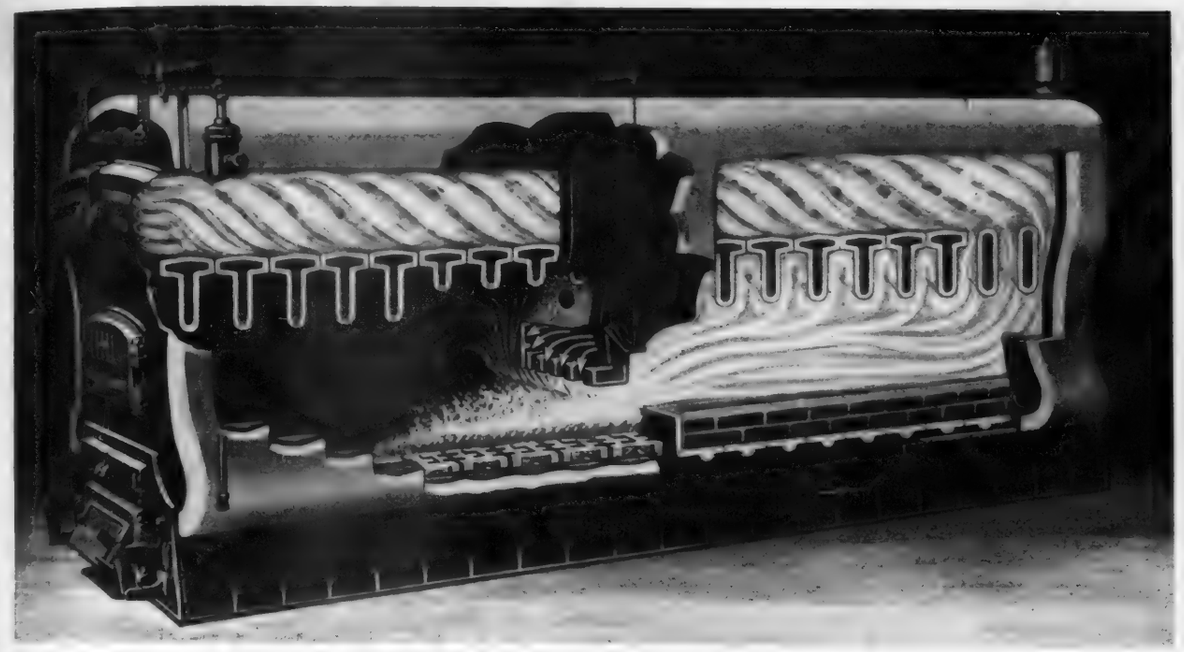
America Fore Bldg., Chicago, Ill.—Over 800 Valves

Hudson View Garden Apartments (14 Buildings), New York—Over 1,000 Valves

Maryland Casualty Bldg., Baltimore, Md.—Over 500 Valves

Complete Details of the EXCLUSIVE FEATURES of this QUALITY VALVE gladly furnished on request.

GORTON & LIDGERWOOD CO.
96 Liberty Street, New York, N. Y.
Established 1887
Representatives in Principal Cities



Cutaway View of Utica-Imperial SUPER-SMOKELESS Boiler

UTICA-IMPERIAL

SUPER-SMOKELESS BOILERS

Utilize Smoke and Soot as Fuel!

A recent improvement put the Air Regulation under easy control from the front of the boilers.

UTICA-IMPERIAL SUPER-SMOKELESS Boilers burn smoke and soot within the boiler, as fuel of remarkable heating value, thus not only eliminating smoke but also attaining great economy and efficiency. This is accomplished by admitting heated air to the fire, on the principle of the Bunsen Burner, igniting the volatile gases and converting them into hot, clean flames of great intensity. The rotative velocity of these hot flames (2400° F. in temperature) not only imparts great heat to the water, but scours the flues clean as well, thus making them clean, efficient heating surfaces. Utica-Imperial SUPER-SMOKELESS Boilers are economical, efficient and easy to operate. Engineers and Contractors are invited to write for complete information.

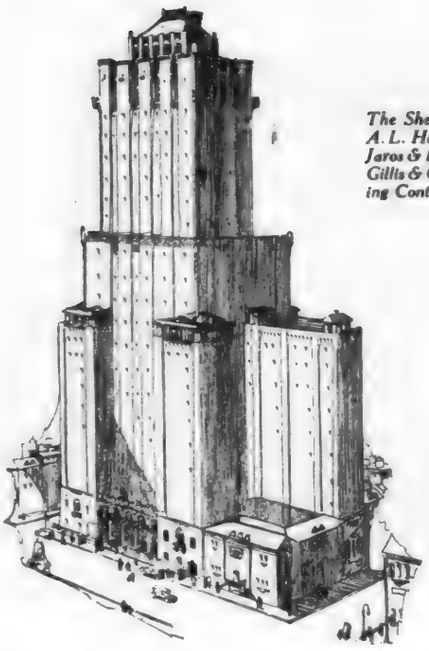
Manufactured by the

UTICA HEATER COMPANY

UTICA, New York

CHICAGO CLEVELAND NEW YORK

Sales Offices in the Principal Jobbing Centers



The Shelton, New York; A. L. Harmon, Architect; Jaros & Baum, Engineers; Gillis & Geoghegan, Heating Contractors.

Who we are and what we do

It pays to concentrate on selling and installing WEBSTER SYSTEMS of STEAM HEATING in small towns as well as big cities. One contractor* has installed 82 Webster Systems—52 of them in his home town of less than 5000 population. He had no competition on most of them. Are you overlooking this opportunity? Ask us about it.

* Name on request.

WARREN WEBSTER & COMPANY are a great deal more than mere manufacturers of heating specialties . . . Webster Systems of Steam Heating are a combination of service, experience, equipment and engineering methods.

Service by a nation-wide organization of trained heating engineers . . . *Plus* Webster System Equipment, which comprises a complete line of steam-heating appliances . . . *Plus* Webster Engineering Methods which insure correct application of Webster System Equipment.

Webster Vacuum Systems and Modulation Systems are regularly specified by many of the leading consulting engineers for fine buildings of every type.

Warren Webster & Company

Pioneers of the Vacuum System of Steam Heating

CAMDEN, N. J. 46 Branch Offices

In Canada, Darling Bros. L'd., Montreal

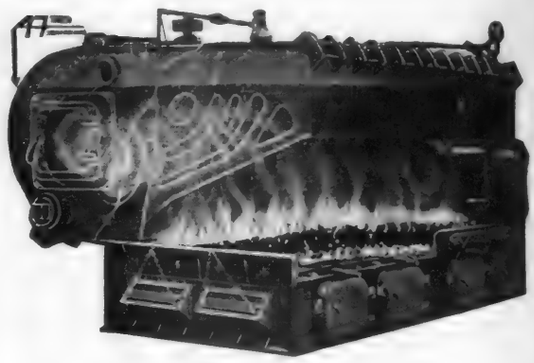
- since 1888

Webster Systems of Steam Heating

More than 34,000 installations in America's finer buildings.

Continental

BOILERS AND RADIATORS



A perfectly even fire --- part of Continental Low Water Line Economy

AN EVEN fire, which is recognized as the most efficient, can easily be maintained on the entire grate surface of Continental Low Water Line Boilers because—

1. They are fired the short way of the grate.
2. Grate bars operate in sections of two or three.
3. Any portion of the grate can be shaken without disturbing the balance of the fire.
4. The slicer door being at the end of the grates, clinkers can be easily removed.

The Continental Low Water Line Boiler is a rapid steamer. It holds a steady water line. It will burn any kind of fuel, including oil. It is made in regular and smokeless types.

30 Series Boilers—43 inch Water Line, 1200 to 8200 sq. ft. steam capacity.

40 Series Boilers—47 inch Water Line, 2500 to 22,300 sq. ft. steam capacity.

Continental Heater Corporation

Home Office and Factory

Dunkirk, N. Y., U.S.A.

Send for this book. It gives the story of Continental Boilers and Radiators. It is a book you should have and a story you should know.

Built for better heating

Page Monarch Smokeless Boilers

No. S-40-12
Monarch

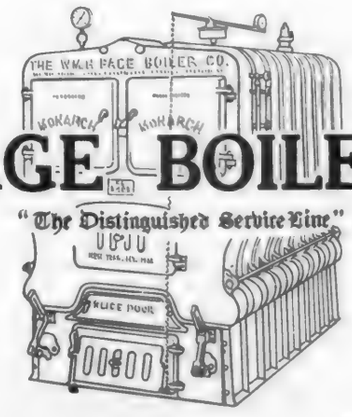
Monarch Smokeless Boilers at the business end of your heating installations will assure your clients of dependable heating service—the desired temperature easily and quickly raised and consistently maintained with a moderate fire.

And there is a Page Boiler—round or square—push nipple or header type—for every heating need.

For more than half a century Page Boilers have been building a world-wide reputation for honest-to-goodness heating service, fuel economy and long life.

The proof of the Boiler is in the Heating!

A request addressed to our office nearest you will bring complete data on Page Boilers.



PAGE BOILERS

THE WM. H.
PAGE BOILER CO.
58 West 40th Street
New York

BOSTON CLEVELAND
PHILADELPHIA MEADVILLE

Established 1856 *Incorporated 1877*

For All Fuels—Hard or Soft Coal, Gas or Oil

Trapping Air from the Boiler *with* Thrush System

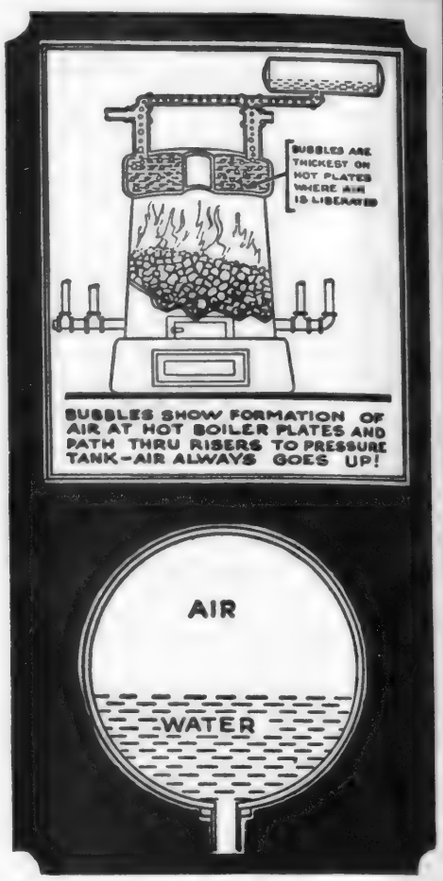
WATER invariably contains large quantities of dissolved oxygen and other gases—the amount depending on the source of the water supply. These gases are given off as the water is heated in the boiler. In Thrush System, this gas or air passes straight up from the heated boiler plates through the risers and into the pressure tank. The illustration at the right shows our unusual method of piping and the path which the liberated air follows.

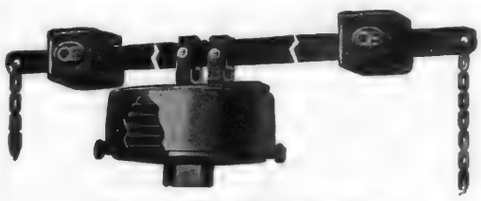
This insures the proper air supply for the Thrush Pressure Tank and not only minimizes the accumulation of air in the radiators but makes efficient use of the air (that inevitably gets into the plant) for maintaining pressure on the system.

Write for Catalog and Prices.

H. A. Thrush & Company

PERU, IND.


BUBBLES ARE THICKEST ON HOT PLATES WHERE AIR IS LIBERATED
BUBBLES SHOW FORMATION OF AIR AT HOT BOILER PLATES AND PATH THRU RISERS TO PRESSURE TANK—AIR ALWAYS GOES UP!
AIR
WATER



No. 2 "O-E" (3 IN 1) Regulator

Three Systems in One

Vapor, part of the time.
Vacuum, most of the time.
Pressure, when wanted.

A Heating System That Can Be Relied Upon

The elimination of floats, return traps, pumps, diaphragms and other complicated mechanism makes the O-E System of Heating the simplest and most efficient. One that provides Vacuum most of the time, Vapor part of the time, and Pressure when it is needed.

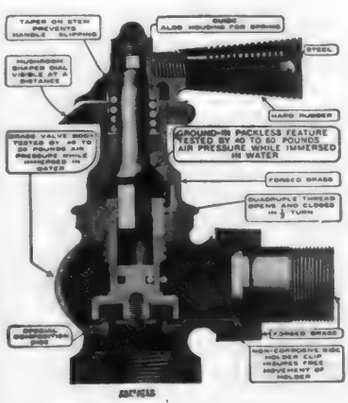
All parts are carefully made and tested, and their performance has shown that they comprise a heating system that can be relied upon.

Many O-E users have heartily testified to the flexibility, economy and efficiency of the O-E Vapor Vacuum Pressure System.

Let us tell you more about O-E and show you some interesting test data.

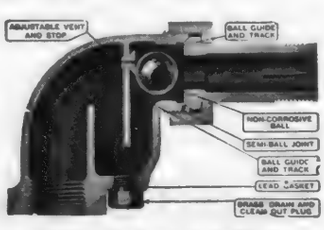
O-E SPECIALTY MFG. CO.

12 KEEFE AVENUE - - - - - - MILWAUKEE, WIS.

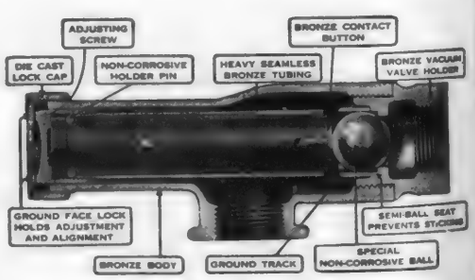

TAPER ON STEM PREVENTS HANDLE SLIPPING
GUIDE ALSO HOUSING FOR SPRING
STEEL
MUSHROOM SHAPED DISC VISIBLE AT A DISTANCE
HARD RUBBER
BRASS VALVE BODY TESTED BY 40 TO 60 POUNDS AIR PRESSURE WHILE IMMERSED IN WATER
GROUND-IN PACKLESS FEATURE TESTED BY 40 TO 60 POUNDS AIR PRESSURE WHILE IMMERSED IN WATER
FORGED BRASS
QUADRUPLE THREAD OPENS AND CLOSES IN ¼ TURN
FORGED BRASS
NON-CORROSIVE DISC HOLDER CUP INSURES FREE MOVEMENT OF HOLDER

"O-E" Improved Perfect Packless Graduated Valve.

Send for Catalog "A."



"O-E" Perfect Ball-Check Water Seal Union Elbow with Adjustable Air Vent.



"O-E" Improved Air Exhauster and Vacuum Valve

ROYAL

ROUND SECTIONAL and SMOKELESS BOILERS

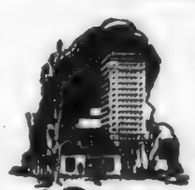
— HART AND CROUSE —

S. W. STRAUS & Co., Fifth Avenue and 46th St., New York City
(22,000 sq. ft. direct radiation equivalent.)

Architects, Warren & Wetmore — Contractor, Thompson-Starrett Co.

CLOSELY identified with ownership and operation of big buildings throughout the United States is the name S. W. Straus & Co.

Two S-552 ROYAL Hart & Crouse Down Draft Smokeless Boilers are installed in the home office of this nationally known concern.



Cosy Cottage
or
Soaring Skyscraper

HART & CROUSE COMPANY

UTICA, N. Y.

BRANCH OFFICES

Boston	*Detroit	*Philadelphia
*Chicago	Grand Rapids	Pittsburgh
Cincinnati	Milwaukee	St. Louis
Cleveland	*New York	*Utica

*Warehouse in connection

EverHot Sales Plan Prize Won by—

John W. DeMott, President.

Left to Right:
John W. DeMott, President.
Irene Miller, Ass't. Bookkeeper.
Edward J. Clement, EverHot Distributor So. California.
Ella Awe, Bookkeeper.

THE CONTEST JUDGES

Left to right—E. C. Harroun of the Harroun Plumbing & Heating Co., Detroit, Michigan—a plumber who enjoys the distinction of selling more EverHot Automatic Water Heaters in 1924 than any other plumber in the United States; Frank W. Shuell, president of the EverHot Heater Company; and W.H. Holmes, president of Holmes, Inc., Advertising Agency.

IN the December 6th issue of Domestic Engineering, the December 15th, issue of Plumbers Trade Journal and the January issue of Heating and Ventilating Magazine we offered a prize of $100.00 or a round trip to the Portland Convention for the best plan, submitted by any Master Plumber in the United States, for securing "old house" business on EverHot Water Heaters. We received many plans from every part of the country. The contest closed February 15th, 1925. The judges were able to complete their study of the plans on April 4th, and on that date awarded the prize to The Hollywood Plumbing & Heating Co., Hollywood, California. Upon receipt of the announcement that they had won the prize they sent us the following telegram which we take the liberty of quoting:

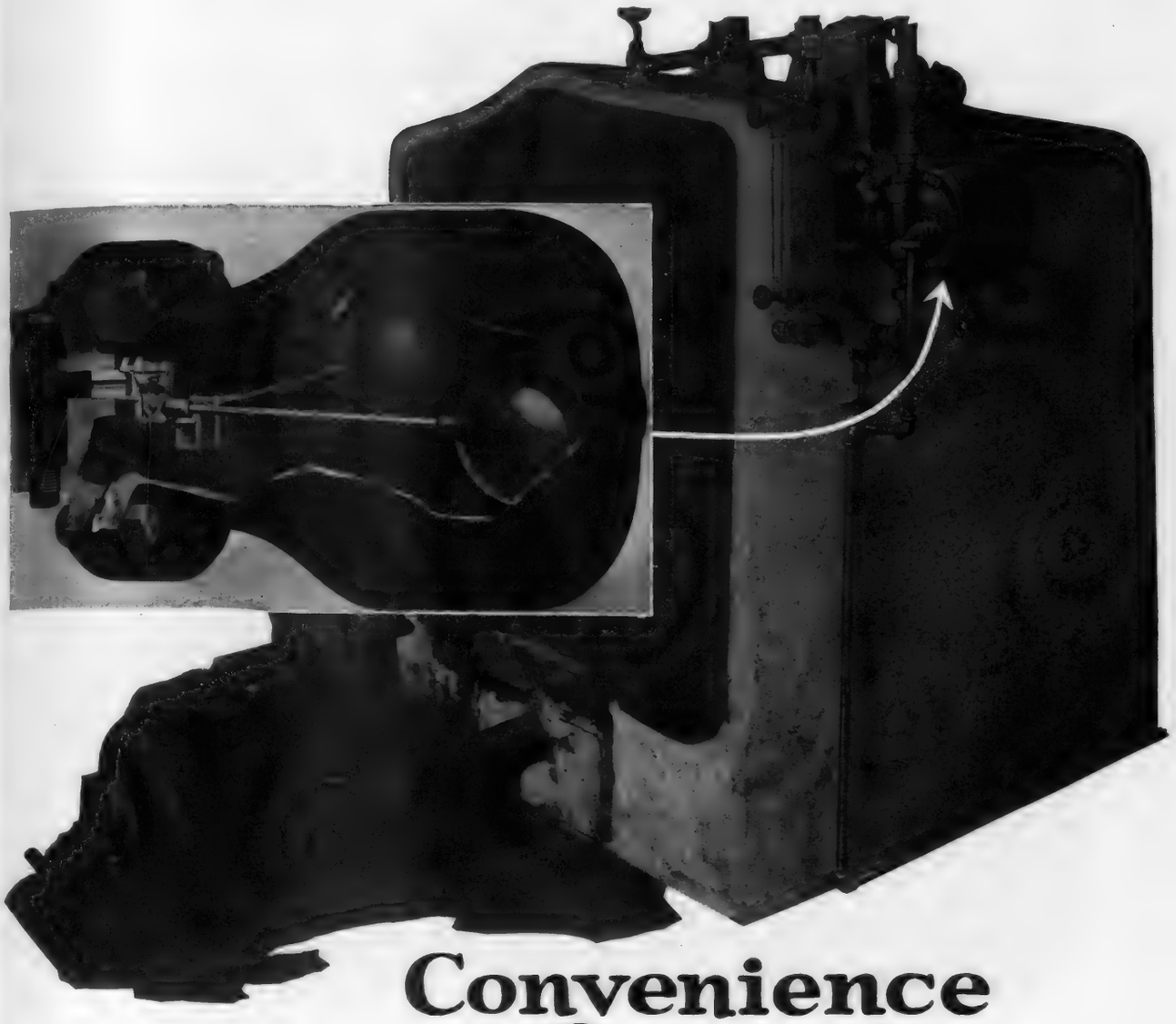
> **"Thanks for wire announcing Hollywood Plumbing and Heating Company winner EverHot Contest Hurrah for EverHot in Hollywood Would have wired you Saturday but was busy installing a number Thirty-two EverHot at Armstrong and Carltons Cafe on Hollywood Blvd. Headquarters for Movie Stars Will forward Picture of store Also of President as requested."**
>
> **JOHN W. DEMOTT, President.**

We want to express our deep appreciation for the way in which the heating and plumbing trades all over the country entered into this contest. It was an inspiration to see the response to our appeal for a plan that would help bring the "old house" water heater business of this country through these trades, the channel through which it should rightfully flow.

A copy of the winning plan will be sent to any Heating Contractor or Master Plumber in the United States upon request.

EverHot Heater Company

5215 Wesson Ave. Detroit, Mich.



Convenience *and* Protection

The McDonnell & Miller Duplex Water Feeder may be applied to all low pressure steam heating boilers, either oil fired, gas fired or coal fired.

McDonnell & Miller Duplex Water Feeders complete the convenience of oil burning heating plants by eliminating the manual control of the boiler water line, and, because their automatic control is absolutely reliable, they add another—and a more important advantage—*boiler protection.*

Whatever the demands on the boiler, the water line can never vary beyond the limits for best economy. The burner can cut in at any time during the day or night without doing any harm—cracked sections and burned boilers are eliminated because the proper boiler water line is always maintained.

The overflow valve prevents flooding the boiler when excess condensate is returned.

Your clients will appreciate the protection and convenience that McDonnell & Miller Duplex Water Feeders afford.

Ask for Bulletin P-1.

McDONNELL & MILLER

"Doing One Thing Well"

WRIGLEY BLDG. M&M WATER FEEDER CHICAGO, ILL.

In San Antonio

The Pipe Basis for Modern Building

SAN ANTONIO is, of all America, the oldest blending of modern utility and beauty with the romance and heroism of the past. Within her confines is the most heroic ground and building in America—The Alamo, cradle of Texas liberty. Her structures, both old and new, afford interest to thousands of visitors annually. The fine churches, schools, theatres, hotels, office and public buildings are indeed a credit to the Great Southwest. In these buildings, sound workmanship and quality materials are evident on every hand. In San Antonio's modern buildings "NATIONAL" Pipe has been generously used.

The buildings illustrated are taken from Bulletin No. 25—"NATIONAL" Pipe in Large Buildings. This publication contains useful data on pipe for building purposes. A copy will be sent upon request.

NATIONAL TUBE COMPANY, PITTSBURGH, PA.

DISTRICT SALES OFFICES IN THE LARGER CITIES

Not Even a Glance at the Heating Plant for Weeks at a Time
HOUSE & GARDEN
ARCHITECTURAL
THE SATURDAY EVENING POST
THE ARCHITECTURAL FORUM

Gas Heating is Nationally Advertised— Nationally Known— Nationally Accepted as the Ideal Method of House Heating

Bryant national advertising reaches millions of readers regularly. Would you like to have preprint folders of this advertising delivered to your desk every four or five weeks? Simply ask to be put on our advertising mailing list.

BRYANT HEATING

***for* Hot Water** (Automatic Gas) **Steam *or* Vapor**

THE BRYANT HEATER & MANUFACTURING CO.
954 East 72nd Street, Cleveland, Ohio
Branches in Principal Cities

The Dunham Skyline Dominates the Nation's Heating

WOOLWORTH BLDG. BROOKLYN EDISON BLDG. PERSHING SQUARE BLDG. CANADIAN PACIFIC BLDG. GOTHAM NATIONAL BANK

ONE expects to find New York City accepting Dunham Low Pressure Steam Heating as best suited to the requirements of the metropolis, and one is not disappointed, for New York has to a very notable degree Dunhamized many of its famous and beautiful buildings.

New York's Outstanding Buildings are Dunhamized.

Such well known structures as the stately Woolworth Building, the Ambassador Hotel, the Canadian Pacific Building, the Gotham National Bank, the Pershing Square Building, and the Brooklyn Edison Office Building, illustrated here, are but a few of many Dunham-heated buildings in Greater New York.

Dunham Advantages of flexibility, simplicity, adequacy, silence and durability won the indorsement of architects and consulting engineers responsible for the heating of these buildings. The good name and long service of the Dunham Thermostatic Radiator Trap are well illustrated by the Dunham Heating System found in the Woolworth Building. This gigantic structure is heated from top to bottom on less than 1 lb. steam pressure. During the thirteen years that the Dunham System has been in service in this building, repair costs have been negligible, and you will learn upon inquiry from the owners that the System has given complete satisfaction.

AMBASSADOR HOTEL

OTHER TYPICAL DUNHAM INSTALLATIONS

In addition to the modern skyscraper, of which a few are here shown, Dunham Heating Service has an enviable recognition in New York's modern apartment buildings. A partial list of these follows:

1133 Park Avenue
522 West End Avenue
320 West End Avenue
323 West 86th Street
79th St. and Park Avenue
1165—5th Avenue
361 Park Avenue
55 East 86th Street
35 West 55th Street
Broadway and 75th Street
41—5th Avenue
1136—5th Avenue
Park Ave. and 77th Street
94th St. & West End Avenue
1030—5th Avenue
4 East 88th Street
58th St. and Park Avenue
7th Ave. and 54th Street
160 Riverside Drive
102nd St. & Riverside Drive
84th St. and Madison Avenue
109rd St. & West End Avenue

DUNHAM HEATING SERVICE

Other cities the nation over agree with New York that Dunham Low Pressure Steam Heating is best. As the metropolis is a Dunham City, so is America a Dunham Nation.

Perfection of design and the consistent operation of Dunham Products, plus a large measure of genuine service to the Architect, Engineer and Owner have won for Dunham Heating this nation-wide acceptance.

C. A. DUNHAM CO.

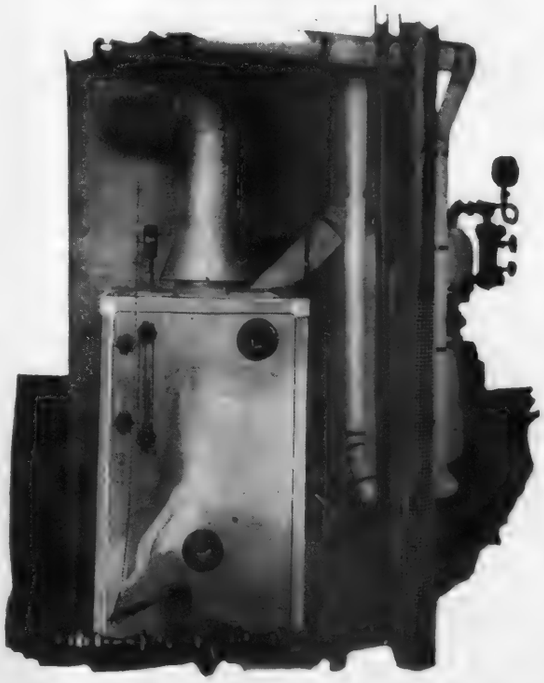
230 EAST OHIO STREET, CHICAGO

Over sixty branch and local sales offices in the United States and Canada bring Dunham Heating Service as close to your office as your telephone. Consult your telephone directory for the address of our office in your city.

IDEAL Gas Boilers need "firing" but twice a year.

There are 80 John Smiths to one Van Rensselaer

IDEAL Gas Boilers are tested and rated under AGA code. Capacity required is therefore only 25% in excess of total condensing load, including piping. Efficiency attained, over 85%.



THE SMALL HOME is the big market for IDEAL Gas Boilers; the compact little house, with servants few, needs the automatic heating equipment that is "fired" but twice a year.

This photograph shows that even the possession of a coal-fired boiler need not prevent the sale of an IDEAL Gas Boiler. Owners often cross-connect their new IDEAL Gas Boilers to the old coal boiler, though coal is seldom used once gas is installed.

Why not let your local Gas Company help you sell *two* boilers where only one was sold before? They are your jobber on IDEAL Gas Boilers and your "service department" as well, for they systematically look after equipment installed on their lines. Your IDEAL Gas Boiler profit is a *clean* profit—yours *to keep*, not to spend in back-calls.

Get our comparative cost data and selling plan. We especially welcome inquiries from Heating Contractors now selling non-solid fuel accessories.

The A. H. Wolff Gas Radiator Co.

Distributors American Radiator Company's IDEAL Gas Boilers

376 Lafayette Street *Dept. G-34* New York, N.Y.

This Apartment House Heated with Maximum Pressure of Two Ounces

—by Mouat System of Heating

THE SHERIDAN APARTMENTS, FORT WAYNE, INDIANA
A. M. Strauss, Architect

Here is an actual example of the efficiency of Mouat System of Heating.

The Sheridan Apartments at Fort Wayne, Indiana, offer comfort and convenience to the occupants as well as economy to the owner through the efficient performance of the Mouat System. The maximum pressure has been two ounces —with no pumps—just the natural circulation. This is no exception —simply a typical Mouat Installation.

Let us send full details

VAPOR MOUAT HEAT

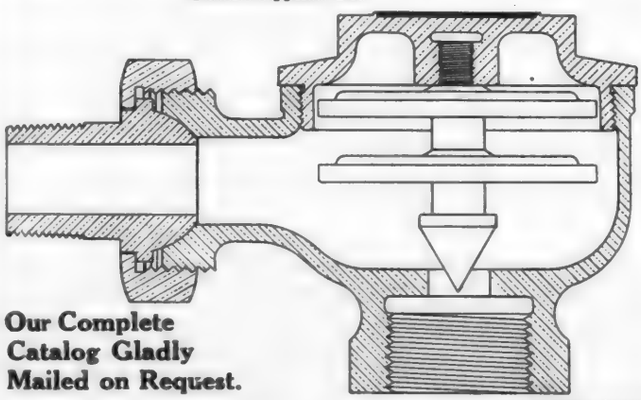
MOUAT VAPOR HEATING COMPANY
CLEVELAND, OHIO

VAPOR MOUAT HEAT

THE
W.D. CASHIN CO.
THERMOFLEX

NO. 2 RADIATOR TRAP

Patent Applied For



Has two separate individual diaphragms in one body insuring unlimited life. All bronze construction, polished and nickel plated. It will pay you to let us show you and quote prices.

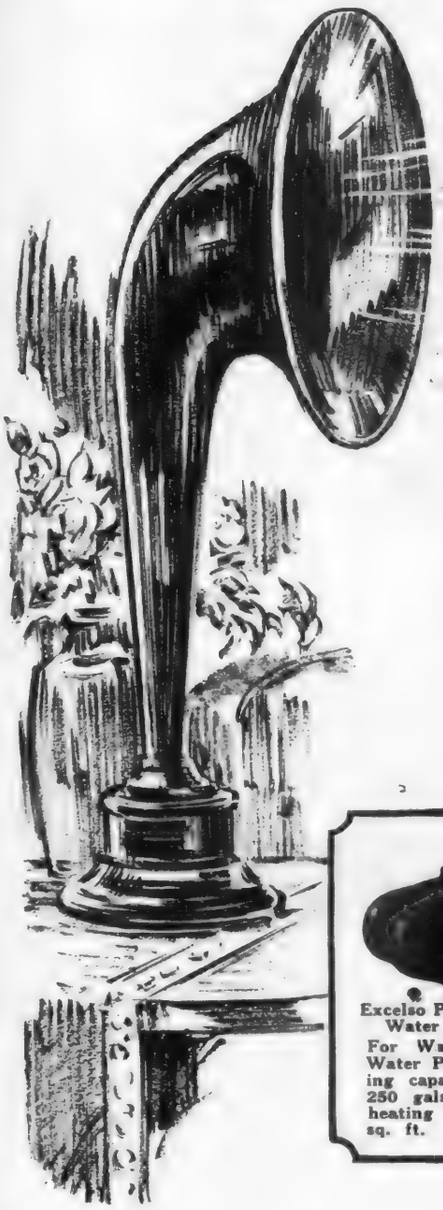
Our Complete Catalog Gladly Mailed on Request.

MANUFACTURED BY

W. D. CASHIN COMPANY

35 HARTFORD STREET BOSTON, MASS.

You Hear About It Everywhere



Excelso Heats Water Practically No Cost

Excelso popularity is well deserved. Thousands in use prove its **quality.** Sales increase steadily year after year.

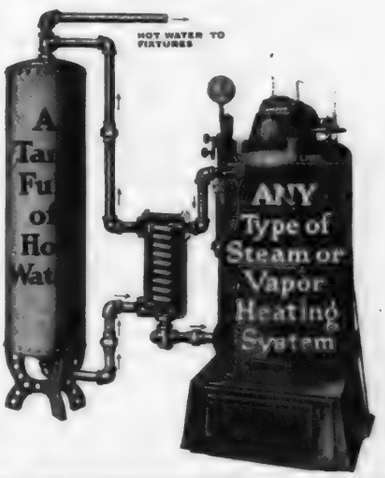
Specify the **good Excelso;** easily connected to outside of any steam or vapor heating boiler. You can be sure the Excelso will give lasting satisfaction because it is the quality heater. Over 250,000 of them are in use.

For further information and details of installations, write:

EXCELSO SPECIALTY WORKS, Inc.
117 Clinton St., Buffalo, N. Y.

District Representatives:
210 E. 45th St., New York, N. Y.
46 Cornhill, Boston, Mass.
5939 Haverford Ave. Philadelphia, Pa.

Excelso PHAETON Water Heater
For Warm Air and Hot Water Plants. Water heating capacities from 30 to 250 gals. Water radiator heating from 40 to 400 sq. ft.



Nationally distributed by the leading Jobbers and Boiler and Radiator Manufacturers

EXCELSO WATER HEATERS

Sold by All Plumbers and Steamfitters

"His work is very good"

Nothing can take the place of a good word spoken for you by a satisfied customer. "His work is very good," means new business for you when the subjects of plumbing and heating are brought up.

Fig. 106, screwed, Standard Bronze Globe Valve

Good opinions must be earned, and much depends on the equipment. And, in keeping the customers well satisfied, valve performance plays an important part.

Fig. 168, Bronze Radiator Angle Valve with male union.

You can feel sure of a genuine Jenkins Valve — sure that it will give maximum service, sure that it will withstand the many severe strains caused by pipe expanding or contracting and lifting or settling. The Jenkins "Diamond" tells you that the valve bearing it has been carefully made from analyses-proved metals, and has been tested to allow a wide margin of safety.

Fig. 325, screwed, Standard Iron Body Gate Valve

To satisfy yourself and your customers, see that only genuine Jenkins are used. Obtainable for practically every plumbing and heating requirement.

JENKINS BROS.

80 White Street....New York, N. Y.
524 Atlantic Avenue..Boston, Mass.
133 No. Seventh St., Philadelphia, Pa.
646 Washington Blvd....Chicago, Ill.

JENKINS BROS., Limited
Montreal, Canada London, England

Always marked with the "Diamond"
Jenkins Valves
SINCE 1864

Insist on the Valve with the FORGED BRASS

THE forged brass tail-nut, a feature of Commonwealth-Lavigne Radiator Valves, makes these valves easier and more economical for the steamfitter to install. Twice as strong as the ordinary cast nut, it will not crack nor break. This nut is designed to eliminate the steamfitters' greatest source of trouble when installing valves, and for your own protection you should insist on genuine Commonwealth - Lavigne — the valve with the forged brass tail nut. Your jobber can supply you.

COMMONWEALTH BRASS CORPORATION
DETROIT

LAVIGNE COMMONWEALTH
RADIATOR VALVES

Hot Water Piping Should Last as Long as the Building

THE hot water piping system has been considered the weakest point in the building. It has almost been taken for granted that this piping must gradually rust and corrode away. Inconveniences such as rusty red water, stained porcelain fixtures and linen, etc., together with real damage from leaking and bursting pipes, ruination of walls and ceilings, have almost been considered inevitable.

It is further known that such things cannot be eliminated, altogether, by the substituting of expensive pipe. Any kind of metal which is practical for pipe material, will corrode.

Lately it has been found that the element which causes corrosion can be removed from the water, making the water harmless and allowing the pipe, of no matter what material, to last as long as the building.

Dissolved oxygen in the water is the trouble maker. It may be removed by de-oxygenating apparatus. Two types, Deactivators and Deaerators, fit into the needs of any building.

Ask for our book entitled "Water but No Corrosion"

ELLIOTT COMPANY

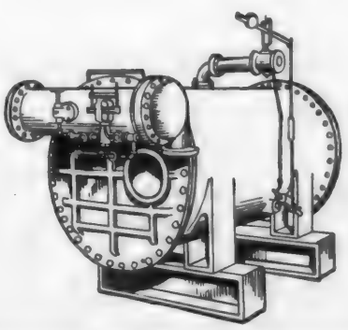
Pittsburgh, Pa.

General Sales Offices: Jeannette, Pa.

District Sales and Service Offices: Atlanta, Baltimore, Boston, Cincinnati, Cleveland, Chicago, Detroit, Kansas City, New York City, Philadelphia, Pittsburgh, and St. Louis

De-oxygen-ating Apparatus

Deactivators Deaerators



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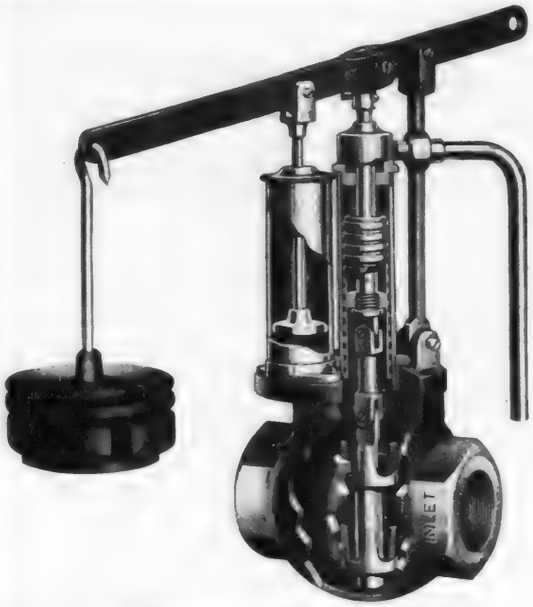


No. 1 Pressure Regulator—Piston Type
Made in sizes ¾ to 14 in. inclusive—Std. and Ex. Hvy.
Sizes 1½ in. and under made with bronze bodies—screwed ends only.
Sizes 2 to 6 in. inclusive made with iron bodies—screwed or flanged ends.
Sizes 7 in. and above made with iron bodies—flanged ends only.

KLIPFEL
PRESSURE REGULATORS

Automatically reduce any initial steam, air or water pressure to any desired reduced pressure above 2 lbs.

Maintain reduced pressure constantly regardless of fluctuations in boiler pressure, or changes in the demand for steam.

Simple, rugged and direct acting. As low pressure builds-up and exerts pressure under piston, a balance is formed between low pressure and weighting, which in turn regulates the inner valve opening.

Visible in action. Lever may be used to open, close or test by hand. Position of inner valve may be easily judged by looking at the lever.

Bronze cylinder, multiple grooved piston and balanced plunger type bronze inner valve. All working parts removable while valve body remains in the pipe line.

No troublesome springs, toggles, packing boxes or pilot valves. Dashpot included, which insures steady service pressure and overcomes any tendency of valve to chatter or vibrate.

Guaranteed to closely regulate at maximum steam loads, as the capacity—size for size—is equal to or greater than that of any competing pressure regulator.

We Invite Correspondence.

KLIPFEL MFG. CO., 2641-59 W. Harrison St. CHICAGO, ILL.

Manufacturers of a Complete Line of Steam Specialties including Expanded Outlet Pressure Regulators (Both Piston and Diaphragm Types)—Float Valves—Pump Governors—Back Pressure Valves—Relief Valves—Grease Traps—Steam Traps and many other Specialties.
Sold by Leading Jobbers in all Principal Cities—Write for Catalog No. 20.

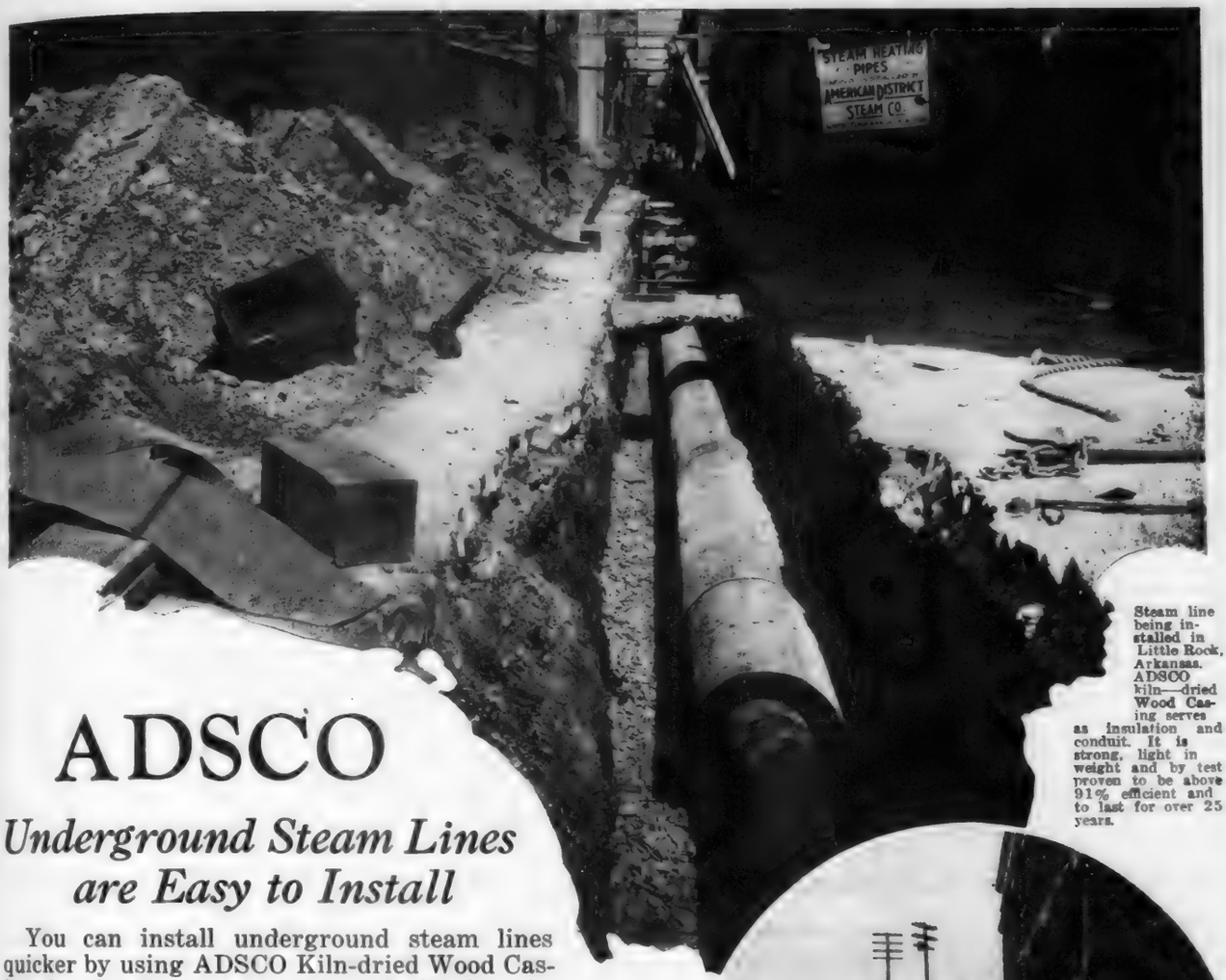
You'll Find—*More Weight Per Dollar*
Better design throughout
in Scott Valves!

The famous No. 1 Bronze Gate Valve—wins by comparison.

There's a heap of satisfaction in putting in valves that last a life time. Scott Valves are over-sized, extra heavy,—so strongly built that after twenty years' service they can be taken apart, repaired and put back on the job as good as new. Measure the 1¼-inch Scott No. 1 Gate for example. You'll find it from 5/16 to ½ inch longer, and from ½ lb. to 1¼ lb. heavier than competitive valves. Moreover, you'll find Scott Valves of superior design and construction—the very best bronze and iron body valves on the market for all plumbing and heating services. For quality and economy recommend and install Scott Valves.

Scott Valve Manufacturing Company
3963 McKinley Avenue Detroit, Michigan

SCOTT VALVES
SINCE 1886
SIGN OF VALUE
"MAXIMUM SERVICE PER DOLLAR"



Steam line being installed in Little Rock, Arkansas. ADSCO kiln—dried Wood Casing serves as insulation and conduit. It is strong, light in weight and by test proven to be above 91% efficient and to last for over 25 years.

ADSCO

Underground Steam Lines are Easy to Install

You can install underground steam lines quicker by using ADSCO Kiln-dried Wood Casing for, by the one operation of slipping the Casing over the pipe, you build the conduit and apply the insulation. ADSCO Casing is light and easily handled for the wood is kiln-dried. This also adds many years to the life of the installation.

You have no loss due to breakage—no trouble due to expansion strains. ADSCO Casing has proved above 91% efficient.

ADSCO Expansion Devices, either packless type or packed slip type, have established their high quality for underground work with thousands of users.

For the small steam line to heat a garage from the boiler in a residence—to the long-distance, high-pressure steam lines for industrial plants—ADSCO Equipment assures permanency. Long practice has shown us the type of material that will give the best results.

Our experienced engineers are ready to make practical suggestions that will save time and expense.

An ADSCO Underground Steam Line furnishes steam to the Library of the Beechnut Packing Co.—no heat loss to melt away the snow on top of this line. Insert shows cross section of steam line.

AMERICAN DISTRICT STEAM COMPANY
GENERAL OFFICES AND WORKS
NORTH TONAWANDA, N.Y.

Offices:
NEW YORK CHICAGO SEATTLE

ADSCO HEATING

TEAR OFF HERE AND SEND FOR INFORMATION

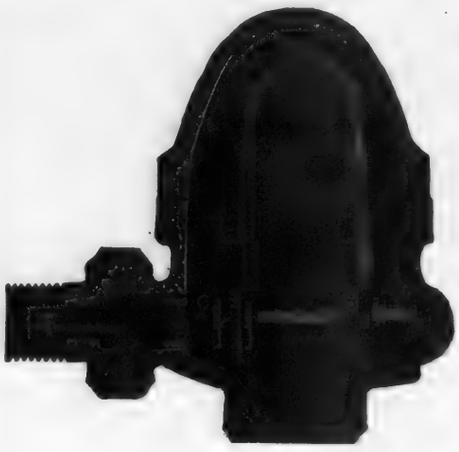
Send information on

- ☐ ADSCO Wood Casing.
- ☐ Expansion Devices.
- ☐ General data on Underground Steam Lines.

Name .....

Address .....

H-2



The Perfect Automatic Valve for Vacuum or Vapor Heating

"VENTO" Advantages

System starts with valve wide open, assuring circulation almost the instant steam is turned on.

Control of valve opening from two to eight times larger than other makes of valves.

Size of valve opening reduces danger of fouling with scale or other foreign matter.

Closes absolutely tight against steam. No necessity for use of spray water at pump.

Cannot stick or gum from foreign matter, and operation is absolutely noiseless.

The "Vento" Automatic Valve represents a steady improvement in the Haines line of steam traps and offers the highest degree of steam trap efficiency.

There has been no change in the old reliable principle that has placed Haines Automatic Valve in a class by itself. The operating power is identical—the only difference being in the general construction.

Special features are: Horizontal mounting of valve mechanism—long range of movement—positive action—quick opening and closing.

Send for booklet

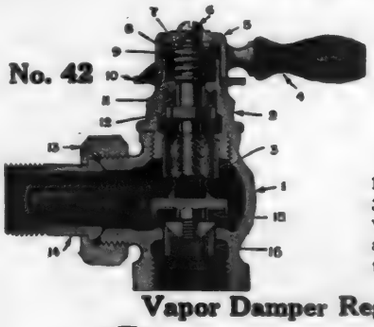
WILLIAM S. HAINES & CO.

12th & Buttonwood Streets

PHILADELPHIA, - - PA.

VENTO

McALEAR SPECIALTIES FOR VAPOR HEATING SYSTEM



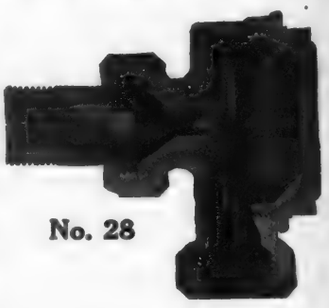
No. 42

Packless Radiator Valves

Quick-opening, nickel-plated brass body. Fig. 38, angle pattern, wood wheel handle; Fig. 42, angle pattern, graduating type, lever handle.

Radiator Traps

Discharge air and water in large quantities. Close tight against steam. Noiseless in operation. Nos. 28 and 28-A of steam metal, furnished N. P. unless otherwise specified. Nos. 28-A and 29-A have right and left-hand discharge openings. Nos. 29, 29-A, 33, 34 and 36 have iron bodies and brass caps, furnished plain unless otherwise specified.



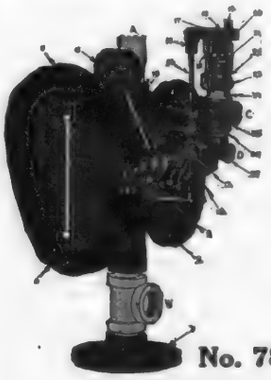
No. 28

Vapor Damper Regulators

No. 58

All metal, tapped for 1-inch steam pipe connection. Shipped complete with lever and two weights, S hooks, 2 ceiling pulleys and 12 feet of No. 10 plumbers' chain.

No. 56 for 0 to 3 pounds pressure, constructed with bellows of 10-inch flexible walls. No. 58 for 1 to 15 pounds pressure, constructed with bellows of 6-inch flexible walls.



Air Eliminator and Return Traps

For automatically returning the water of condensation direct to boiler and discharging air. Minimum distance between water line of boiler and bottom of trap should be 18 inches. "A"—inlet to trap; "B"—discharge to boiler; "C"—steam connection to boiler; "D"—air vent.

No. 781

Combination Float and Thermostatic Ball Check Valves

For venting supply and return mains of heating systems. These air valves close tight against water and steam, and by use of the check prevent the atmospheric pressure from entering the discharge opening.

No. 15

THE McALEAR MFG. CO.

1901-7 S. Western Ave.

CHICAGO, ILL.

PALMER HOUSE, CHICAGO

Over 5600

Marsh Packless Radiator Valves installed in this, the Largest, Most Costly to build and Luxurious Hotel in the World.

RE-ENFORCED PACKLESS
FIG. 133

Architects
Holabird & Roche, Chicago
General Contractor
Thompson-Starrett Co., New York
Heating Contractor
Phillips, Getschow Co., Chicago

We specialize on high grade radiator valves, therefore quality, and manufacture the largest line of any company in the business, therefore volume which admits of price, and, quality and price talk.

MARSH VALVE COMPANY

DUNKIRK, **NEW YORK**

Exclusive Sales Distributors

Appleton & Liptrott, Inc.
1480 Broadway, New York

Edward T. Hetherington,
1718 Sansom St., Philadelphia

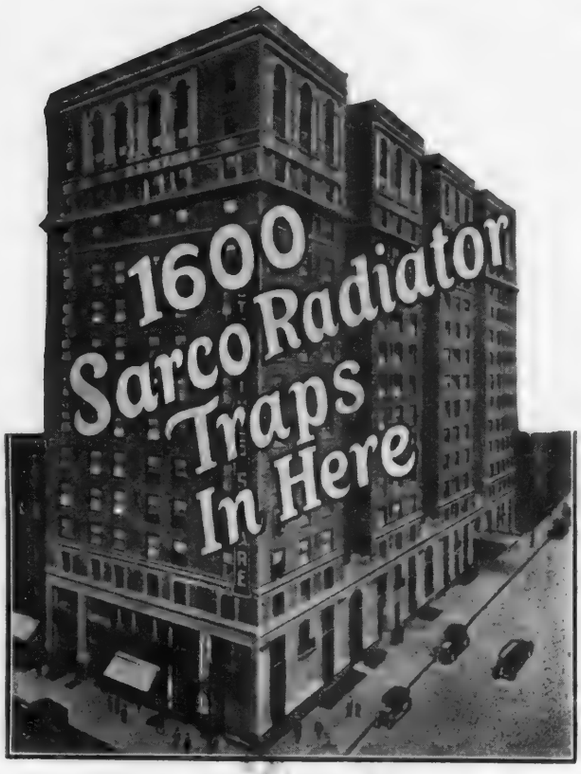
United States Radiator Corp'n
General Offices: Detroit, Mich.

All territory east of west lines of Michigan and Ohio and north of Virginia, except New York and Philadelphia.

John W. Mabbs,
431 So. Dearborn St., Chicago, Ill.

Jas. P. Marsh & Company
118 So. Clinton St., Chicago, Ill.

All territory south of Ohio River and west of Michigan and Ohio, except Cook County, "Chicago, Illinois."



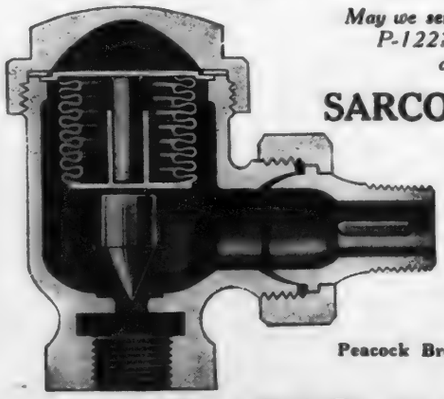
Times Square Hotel—New York

GRONENBERG and Leuchtag, New York Architects and Engineers, responsible for this architectural masterpiece, could not afford to take chances with the heating system in this 1,000-room hotel. So Sarco Radiator Traps went in—for past experience had convinced them that the Sarco was a good, dependable long-lived trap.

This noiseless, factory-adjusted trap will not air bind, water hammer nor freeze. It is self-cleaning and easy to take apart.

The casing is made of extra heavy cast brass, free from blow-holes and defects.

Has unusually large discharge opening and high lift.



May we send you our Booklet P-122? What is your address?

SARCO CO., Inc.

231 Broadway, New York City

Boston Chicago
Buffalo Cleveland
Detroit Philadelphia

Peacock Bros., Ltd., Montreal

SARCO RADIATOR TRAP

A Profitable Follow-up for "Spring Clean-up"

Sell it to Every Oil Burner User

Spring is the clean-up season. But why confine it to Spring? Oil burner users especially want clean homes and yards 365 days in the year. Sell them the Home Incinerator by showing them how it eliminates the unsightly rubbish barrel and filthy garbage can.

The Home Incinerator is a real achievement, ingeniously constructed, elbow high, far in advance in its field. Consumes garbage and rubbish completely without smoke or odor. Perfect combustion. Dependable, economical in operation. Positively needs no servicing, a clear profit on every sale.

Feeds through large top opening. Lights with push-button, dumps ashes with convenient lever into deep, heavy galvanized ash pan. Easily installed in any basement. Portable type.

Make big profits now. Follow up Spring Clean-up with Home Incinerator sales!

HOME INCINERATOR COMPANY

209 Grand Avenue, Milwaukee, Wis.

Write for specifications and prices.

The Home IncineratoR

This splendid school will be HV Fan *equipped*

SIX supply and seventeen exhaust fans, *all* Clarage NEW type HV, will be used for adequate ventilation in the new East High School of Denver, Colo.

The incoming air, 175,000 cubic feet per min., will be washed and scrubbed *clean* of impurities and properly humidified by six Clarage Improved Type V Washers.

The architect for this splendid building is George H. Williamson; chief engineer, James J. Ball, Board of Education; while the equipment will be installed by McCarty-Johnson Heating & Engineering Co. All are of Denver.

You can easily understand the large saving in operating expense which the Denver School Board will effect. Every HV Fan is *guaranteed* to reduce power requirements 15 to 20%, as compared with other multiblades.

Notice the other Clarage HV contracts now under way. Quality equal to the best, lower operating costs, sometimes lower first cost—these are the reasons for the *instant* recognition and approval, which HV Fans have received from you experts.

If by chance you haven't a copy of Clarage Reference Book 53, let us mail you one immediately. *It tells our whole story in a convincing way.*

Other Recent HV Contracts Include

New York Edison Co., New York City (51 Units)

Sherman Hotel Addition, Chicago (21 Units)

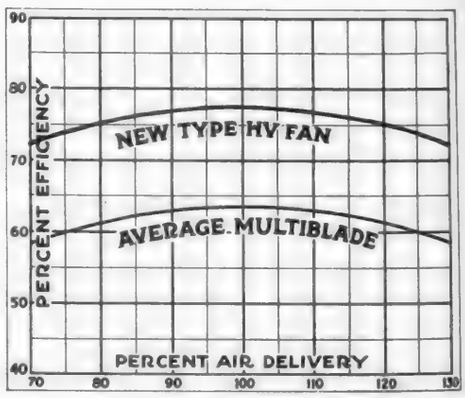
Washburn School, Washburn, Minn. (5 Units)

Grand Trunk Shops, Battle Creek, Mich. (2 Units)

United Masonic Temple, Chicago (21 Units)

Washington Duke Hotel, Durham, N. C. (4 Units)

Muhlenburg College, Allentown, Pa. (5 Units)



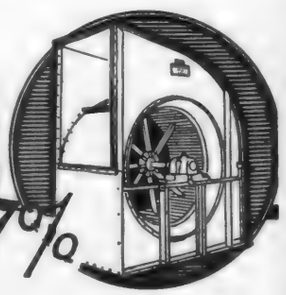
This chart explains why

CLARAGE FAN COMPANY, Kalamazoo, Mich.

SALES ENGINEERING OFFICES IN 18 PRINCIPAL CITIES

CLARAGE MULTIBLADES

New Type HV maximum efficiency 77%



Barnes & Jones

Stock Valves Solve High Pressure Problem

WHEN STANDARD STOCK VALVES meet the extraordinary conditions which confronted Lockwood Greene Company when they laid out the plans for the Libbey-Owens Sheet Glass Company's new plant at Toledo—it may be truly said that these valves are of an exceptionally high order of efficiency.

SOME sections of this plant required the use of steam at considerably higher than ordinary pressures. To adequately meet all the unusual conditions in connection with this installation thermostatic traps of proven quality had to be secured. Lockwood Greene decided to use BARNES & JONES appliances for this plant after thorough personal examination and rigid comparison.

THE BARNES & JONES valves submitted to Lockwood Greene for this test and for this installation were of standard BARNES & JONES construction, and were taken out of regular stock with no exceptions. No more conclusive evidence of the quality and efficiency of BARNES & JONES standard stock appliances can be submitted.

B&J Barnes & Jones B&J

5 Melrose Street *Boston, Mass.*

Vapor and Vacuum Heating Equipment of Proven Quality

Suppose there were no cook books

EVERY KITCHEN has a cook book. The boiled down experience of many cooks is found in its pages. Like cook books, Linde books do not talk about the ingredients, but how to put them together to produce better results. Every one of the thirteen Linde books contains essential and practical information on some phase of oxy-acetylene welding or cutting. Each is based on field experience and laboratory research.

Plumbers and Steamfitters use these Books

"Gas Welded Pipe Joints," for example, is used by one executive to instruct his men and as a basis for discussing welding problems with them. The Linde library makes it possible for any executive to become well informed about the oxy-acetylene process. Linde books are free to Linde users for the asking.

Check the books you want, tear out this list and mail it to the nearest District Office

- ☐ Cast Iron Welding by the Oxy-Acetylene Process
- ☐ Gas Welded Pipe Joints
- ☐ The Oxygen Lance
- ☐ Step by step in Gas Welding a Crank Case
- ☐ Step by step in Gas Welding a Cylinder Block
- ☐ Step by step in Oxwelding a Pipe Joint
- ☐ The Importance of Managerial Understanding of Welding
- ☐ The Handling, Storage and Return of Cylinders for Compressed Gases
- ☐ How Welded Joints Solved Pipe Line Troubles
- ☐ Welding Small Tanks by the Oxy-Acetylene Process
- ☐ Welding and Cutting for the Manufacture and Maintenance of Chemical Equipment
- ☐ Severing Metals by Oxidation
- ☐ The Dependability of Cast Iron Welding

THE LINDE
AIR PRODUCTS COMPANY

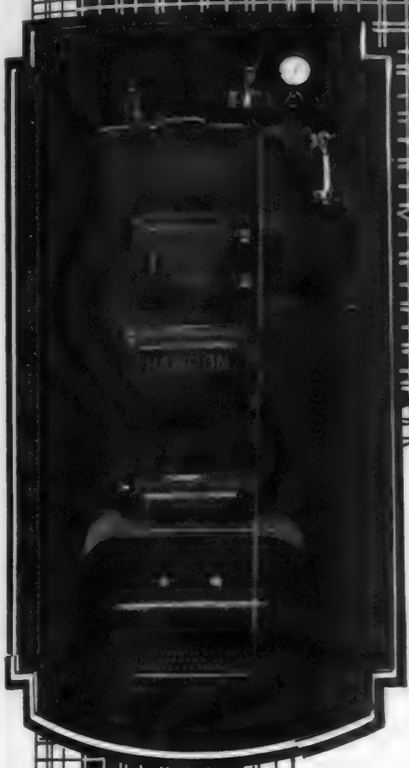
General Offices:

Carbide & Carbon Building
30 East 42d Street, N.Y.

37 PLANTS—85 WAREHOUSES
22 DISTRICT SALES OFFICES

LINDE OXYGEN

YOU CAN DEPEND ON THE LINDE COMPANY



HANDON

A Few Reasons Why Handon Charcoal Iron Boiler and Tank Heater Sales are Increasing:

1 - There is no BETTER BOILER sold anywhere at any price.
2 - A BETTER casting, made of CHARCOAL IRON.
3 - FULL grate area.
4 - MORE prime heating surface.
5 - Steams QUICKLY and RETAINS heat.
6 - Long fire travel.
7 - EXCELLENT SERVICE.
8 - Made right, by EXPERT FOUNDRYMEN.
9 - Gives COMPLETE satisfaction.
10 - The customer COMES BACK for more.

Send for catalogue and discount sheet to

Handon Boiler Corporation

General office and salesroom,
101 Park Avenue, New York, N. Y.

HANDON

CHARCOAL IRON BOILERS & TANK HEATERS

VECO

Announcing the

VECO SPECIALTIES

for VAPOR HEATING

Effective May 1, 1925, Charles E. Scott, former vice-president of the Vapor Heating Company, and for 18 years Manager of the New York Office, announces the organization of the

VAPOR ENGINEERING COMPANY

489 FIFTH AVENUE, NEW YORK

Manufacturers and Distributors of

VECO Specialties for Vapor Heating

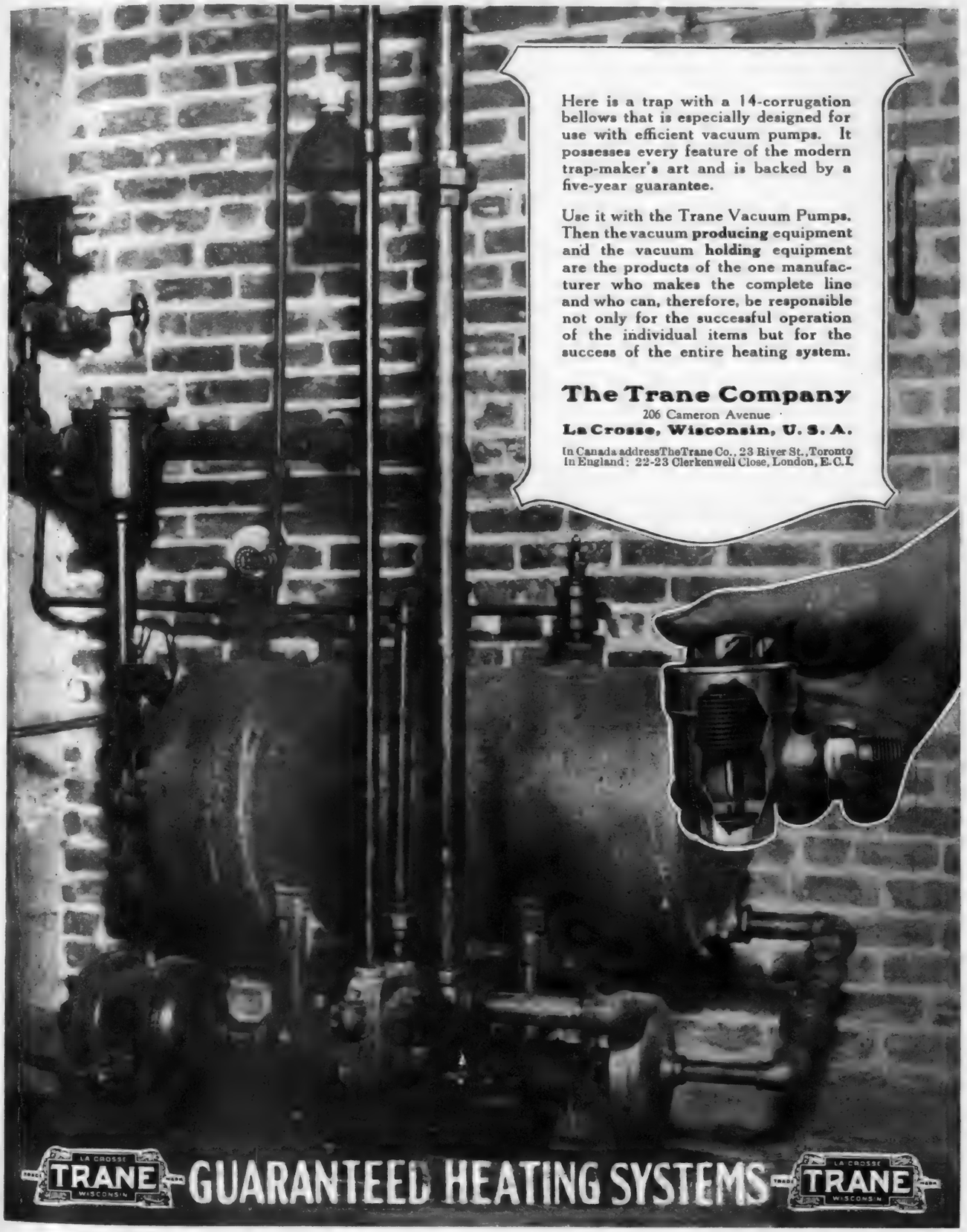
Reliable and guaranteed engineering; careful personal inspection of work under construction; Vapor Specialties of superior manufacture and modern design.

Associated with Mr. Scott in this Company are J. Wilbur Glassey and Mitchell S. Buck, who will have control of the Philadelphia territory.

VECO

WHY DIVIDE THE RESPONSIBILITY?

use TRANE TRAPS with the TRANE PUMPS



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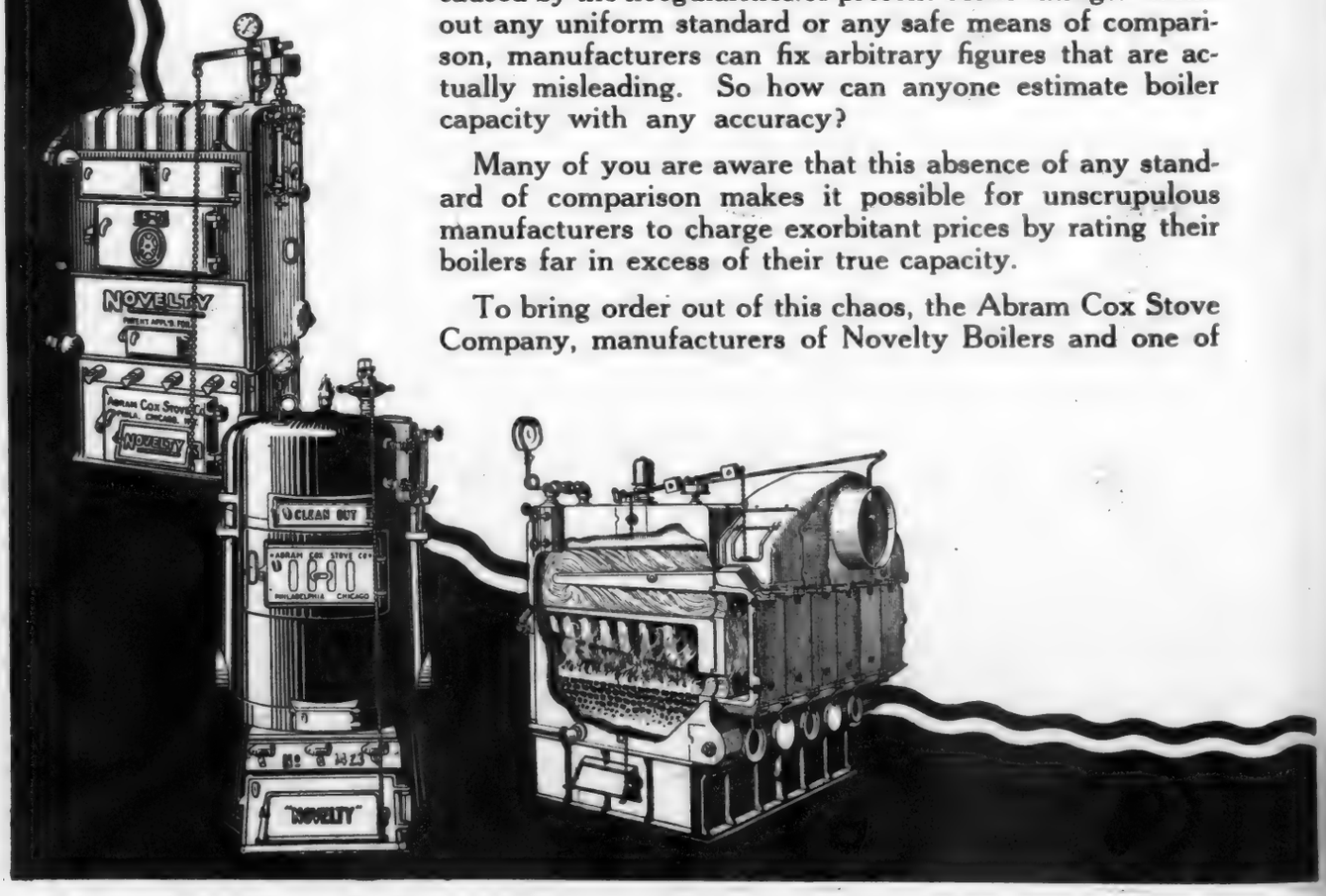

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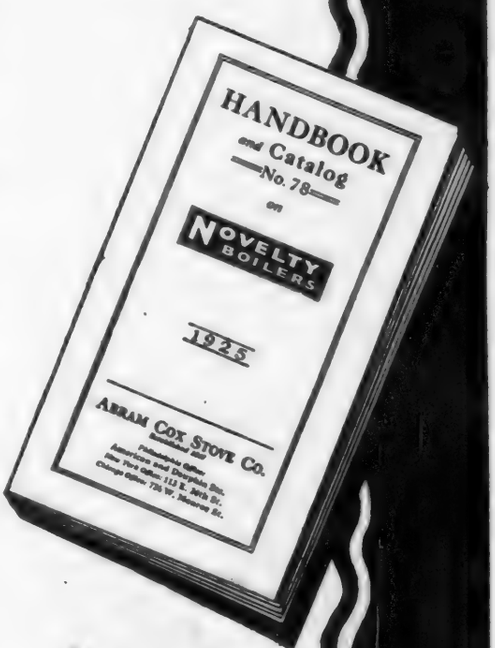

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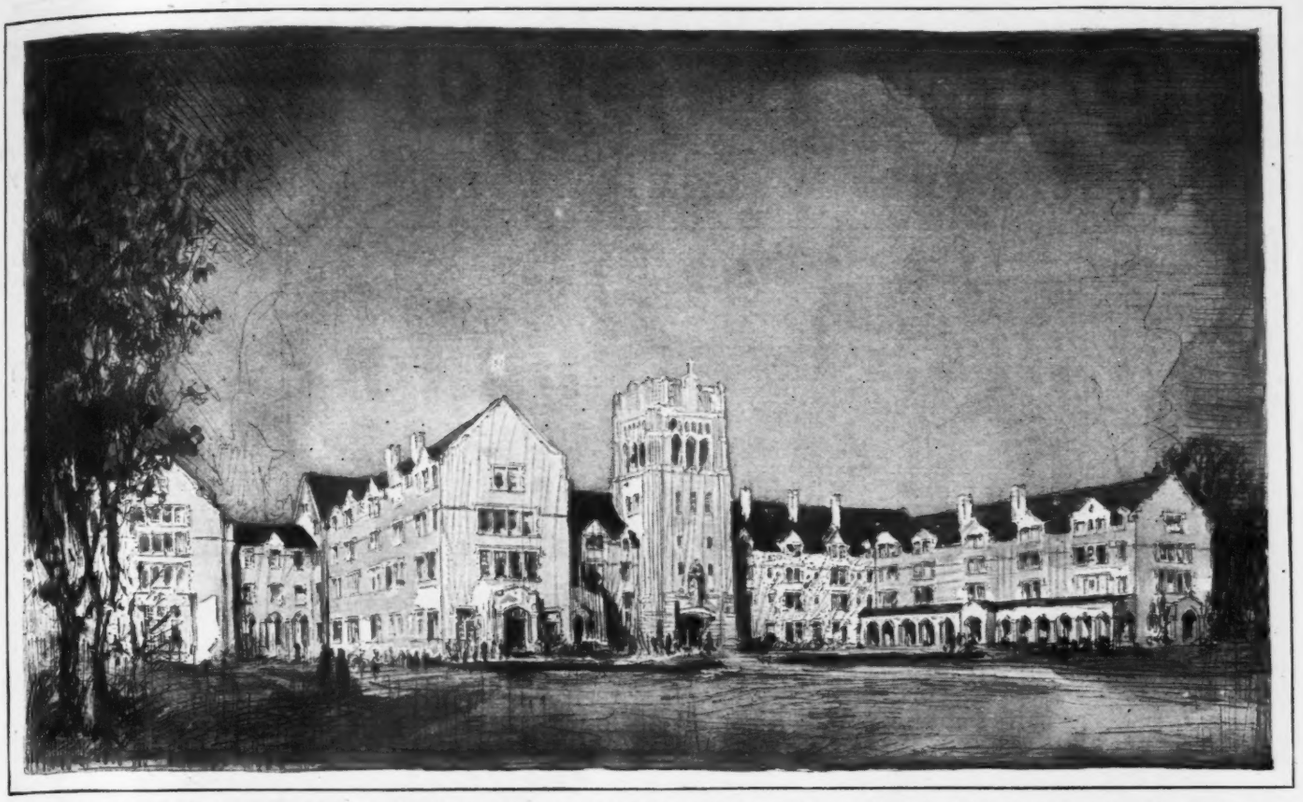

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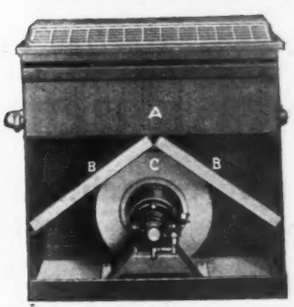

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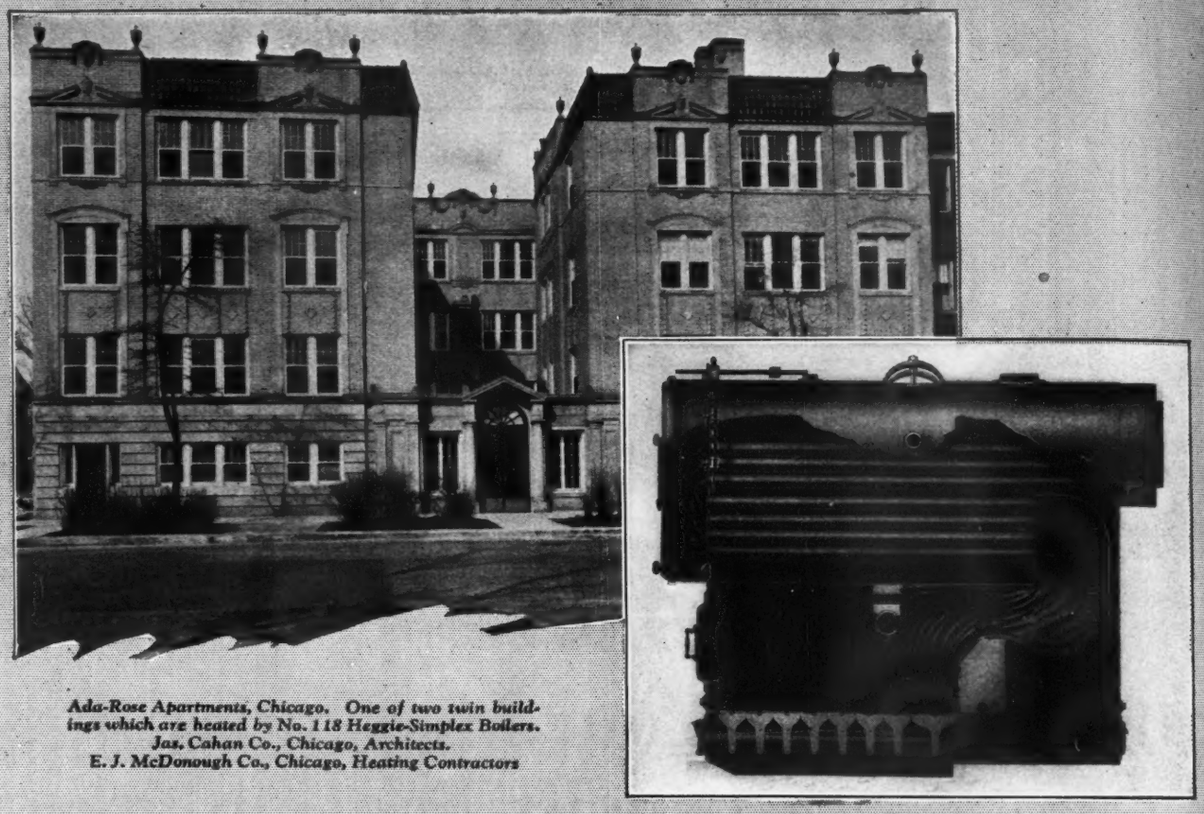

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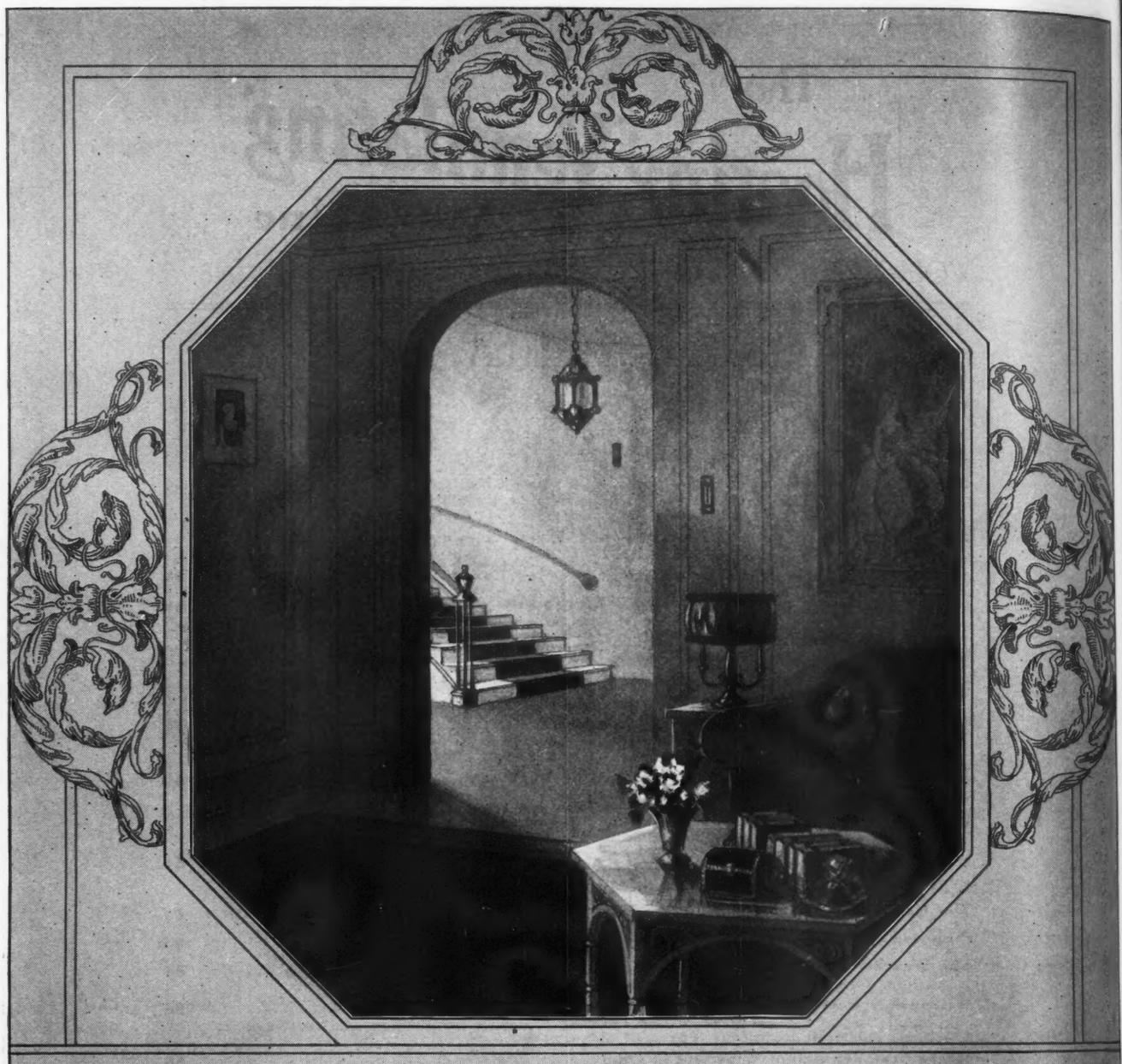

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